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AND THE PRINCE OF WALES' NEW TABLE BOOK.

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BY WILLIAM ALCOCK, 9, SAINT MARY'S STREET, MANCHESTER.

MDCCCLVIII.

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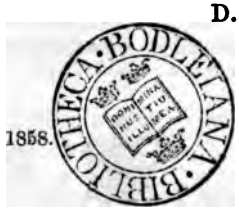
D. O'GORMAN.

13, Smithy Door,
Manchester, 1858.



ENTERED AT STATIONERS' HALL.

The Queen's Approbation of the Work.

"Buckingham Palace.

"Miss Skerrett begs to inform Mr. O'Gorman that Her Majesty received the Arithmetic which he sent. Her Majesty thinks it a Book likely to be of great service in teaching ready calculations. Her Majesty was graciously pleased to accept of the Copy.

"Mr. D. O'Gorman."

EXTRACTS FROM LITERARY NOTICES.

AMIABLE CONDUCT OF HER MAJESTY TO A RESIDENT OF THIS CITY.—"Her Majesty has been pleased to receive the book, and has, in the most handsome manner, expressed her high opinion of the merits of the work. Such a criticism, from the most illustrious personage in the realm, must go far to render the book universally sought after, and a 19th edition is already, we understand, in the press."—*Durham Chronicle.*

"Some short time ago Mr. O'Gorman published an Arithmetic, showing a simple and ready mode of performing various calculations. The author sent a copy of his new work as a New Year's present to the young Prince of Wales. Mr. O'Gorman received an acknowledgment from Her Majesty, which, perhaps, is the first instance on record of a testimonial being given by the most illustrious personage in the realm on the merits of a book."—*Sunderland Herald.*

"Persons now well matured in years may remember with a sigh—in the days when they were boys—

'The good old days when George the Third was King'—

the roundabout mode of calculation they were taught by their arithmetic master, and the quantity of time and paper they used to consume in noting down figures to solve a rule-of-three sum. But in the thirty or forty years that have elapsed since then, everything has been going on—as Brother Jonathan would say—on the 'go-ahead' principle. Slow has been abolished for expeditious travelling—the stage-coach has given place to the railway train; the sailing vessel to the steampacket. It now seems that we are to do away with any jog-trot pace in calculations. Difficult sums which took those now 'in the sere, the yellow leaf,' a quarter of an hour to solve when they were youngsters, can now be done by their sons or grandsons in a minute or two, and instead of on a sheet of foolscap paper, on the back of a small card. Mr. O'Gorman's system brings to bear upon common arithmetic the principle of algebraic brevity. Surely never since numbers became a science was there ever such a ready and rapid method for solving questions in arithmetic, even the most difficult and most complicated. The rules are easy, brief, and explicit, with clear examples given after each. and to render these rules comprehensible, a reason attached to each. The book is useful to young as well as to old people—to men in business, even to accountants, who, whatever methods they have adopted by their own ingenuity to expedite and facilitate calculations, will derive benefit from a perusal of Mr. O'Gorman's book. To recommend it were supererogatory: we have only to record that it has already had upwards of 24,000 purchasers, from the highest to the lowest in the land, and that its immense popularity is well merited on account of its great and universal utility."—*Weekly Times.*

"The value of time in the counting-house, or behind the counter, needs no comment; and how much of that time is occupied by even good arithmeticians is known to every employer. A work therefore that has the effect of facilitating existing systems, but better still, of superseding them by one which gives to mental calculation the certainty of proof, is indeed an acquisition which cannot be too highly estimated. We find in this work rules which we have verified, by which six ordinary calculations are reduced to two, and frequently to one. We cannot too highly commend this volume to masters of schools, or to those young men who, entering into business, whether as employers or employed, would wish to shorten their labour at their books, and ensure accuracy beyond the reach of accident. Her Majesty has given the treatise the honour of her patronage."—*Southampton Gazette.*

"This seems to us the most useful book of its kind we have ever seen. Its merits are sufficiently testified in an 18th edition of 24,000 subscribers, including some of the most eminent names in the commercial world."—*Standard.*

"We would direct the attention of parties engaged in business to a valuable little publication, entitled *Intuitive Calculations*, by Mr. D. O'Gorman, who is now on a visit to this town, with a view to promote its general adoption. In these railway times, expedition has, undoubtedly, become the order of the day, and not only in our means of locomotive communication, but in the operations of trade and commerce also, the attainment of the utmost possible despatch is regarded as essential. This is the object of Mr. O'Gorman to promote, and he has done so effectually, so far as figures are concerned, for those who are disposed to consult the pages of his inexpensive little volume. He has laid down plain and simple principles, by which business calculations may be made with equal certainty, but with greater rapidity than by the prescribed rules of arithmetic. Of what, for instance, is commonly known as 'long division,' examples are given, showing the quotient in one line at the bottom, like 'short division.' No stronger recommendation, however, can be given to the work than the fact that it has reached an 18th edition."—*Birmingham Herald.*

"Mr. O'Gorman's 'Calculations,' correctly termed 'Intuitive,' is that which suggests itself to any man accustomed to calculations, as distinguished from conventional rules. It must have occurred to many that almost every man reckons 'in his own way,' and that way is generally any other than the way taught him at school. Mr. O'Gorman has, as it were, reduced his natural process of calculation to a system, and made a very interesting and instructive volume."—*Birmingham Journal.*

"This is one of the simplest and shortest systems of popular Arithmetic that we ever met with. To those who have the painful remembrance that we have of the labour that it costs boys to work the old rule-of-three problems, according to Gough or Cocker, this little volume will appear one of the *treasures of the rising generation.* Many of the rules for solving with certainty, and in an instant, the most complicated arithmetical questions, are so simple that a child may comprehend them. *The work is really a marvel of ingenuity.*"—*Hull Advertiser.*

"We have been careful to give attention to the rules laid down, and examples given after each rule, in Mr. O'Gorman's improved system of calculation; and, from the manner in which the author has treated the science of numbers, we are not at all surprised at the extended patronage he has already received. Our opinion as to its merits is, we are happy to say, corroborated by that of men of science, as well as our brethren of the press, as will appear from the testimonials appended to the work. We ought, perhaps, to add, that Mr. O'Gorman's method can be attained without the aid of a master; his book is, therefore, adapted not only to aspiring youth, but to those more advanced in life, who by its study, will effect a great saving of time and labour in all ordinary transactions."—*Newcastle Guardian.*

"Mr. O'Gorman's new work has gained a favourable critique from Her Majesty and a great portion of the local press. The system would appear to be just that which every clever man of business has suggested to him in his experience, as distinguished from the roundabout mode taught in the arithmetics in common use. The author, it will be seen, is also his own bookseller."—*Newcastle Journal.*

"Mr. O'Gorman's *Intuitive Calculations* is the most concise course ever published. We some time ago possessed ourselves of a copy of the work, an improved edition of which, the author, we believe is about to issue. Its contents fully justify its title. It is calculated to be of great service to men of business, and, indeed, to all classes. It is a striking example of labour and ingenuity on the part of its author."—*Stockton Times.*

"In the present railway era, expedition in most things is desirable; and to a man of business, any method that will expedite calculations and simplify accounts, must be of the utmost importance. Such a method will be found in Mr. O'Gorman's *Intuitive Calculations;* and his explanations are so clear, that they will be readily understood by every person who has any knowledge of figures."—*Nottinghamshire Guardian.*

"We have pleasure in drawing attention to Mr. O'Gorman's improved method of acquiring a knowledge of arithmetic. To all persons engaged in business, a perusal of this treatise would greatly facilitate the transacting of accounts; and to young persons it may be recommended as a useful guide to a most essential branch of education."—*Preston Guardian.*

"Mr. O'Gorman's *Intuitive Calculations* is a well-written and useful work, particularly adapted to men in business, with whom training in ready calculation ought not to be neglected. An immense waste of time is incurred by a defective practice in this respect; and, indeed, than arithmetic in general, there is no science where the acquisitions of boyhood are less made use of in maturer years. Men of business habits—nay, accountants themselves—will often be found spending hours or days in multiplying and dividing, adding and subtracting—covering with figures a space as great as the wall of a house—where the use of the simplest algebraic formulæ would have solved the difficulty at an expense of three minutes of time and three square inches of writing paper. Mr. O'Gorman's work is meant, and we think succeeds, in reducing to popular practice the principles of this most important branch of education."—*Liverpool Mercury.*

"We have often wondered at the slavish adherence of people in business to the old system of doing all their calculations by what are called 'Ready Reckoners,' which are as numerous and various as the hues of the chameleon. Even these 'helps to count' do not save calculation, as, were they to meet all possible cases, their bulk would be referable to the favourite exclamation of Dominie Sampson. Any attempt, therefore, to simplify arithmetic, so as to make every man and woman their own 'Ready Reckoner' is a step in the right direction; and we have much pleasure in calling attention to Mr. O'Gorman's new system of *Intuitive Calculations*, a work which we have every reason to believe will, with very little study, supersede the antiquated system of dependence on 'Reckoners,' however 'ready' they may be supposed to be. As a manual for schools, it must be invaluable; and we believe the work has already been introduced into upwards of five hundred seminaries."—*Glasgow Constitutional.*

"In the work before us, the methods laid down are easily digested, and come within the comprehension of almost any capacity, and the rules are so clear and short, with a reason attached to each, that the mind must be dull, indeed, which cannot, after a perusal of it, transact business in the tenth part of the time usually occupied on such occasions. There is a brevity, with perspicuity, that enhances the value of the book, and, in our opinion, it would be well if it were on the counter, and in the counting-house of every business-man in the united kingdom."—*Stirling Observer.*

INTUITIVE ARITHMETIC.—"The treatise published under this title by the author, Mr. O'Gorman, is really what the advertisement in another page asserts it to be, namely, the readiest and most concise method of calculation ever published. The rules are brief, yet perfectly explicit; and a reason being attached to each, a lasting impression is thus imparted to the youthful mind. The results, too, are given in a sixth part of the compass usually occupied by those in similar works. The system of Mr. O'Gorman is therefore not only novel but unique. In short, it may be denominated the *Royal Railroad* to arithmetic, having obtained the patronage of Her Majesty the Queen to the work, 'as a book likely to be of great service in teaching ready calculation.'"—*Caledonian Mercury.*

"How many men there are who would be deeply grateful for the ability to make their commercial calculations with facility and despatch, but who—remembering that they bestowed in their school-days many years of unrequitted labour and anxiety in the endeavour—utterly despair of ever being able to gain anything like a satisfactory mastery over the science of numbers. During the adult life, treatise after treatise has been consulted with the hope that the secret of success would at length be discovered; but the search for the philosopher's stone to the man of business has been fruitless. Calculations have, therefore, continued to go on, even in the nineteenth century, at a mere jog-trot pace, and the operations are consequently regarded by many men as the most disagreeable, although amongst the most necessary, of their commercial duties. A gleam of hope, however, may yet be entertained that the science of numbers will ere long be generally considered as one of the most simple and easily acquired accomplishments of the age. Mr. O'Gorman, in the work before us, has rendered the study of arithmetic exceedingly plain and intelligible, and to those who are accustomed only to the long and tedious processes hitherto in use, the ready and

concise methods of Mr. O'Gorman will appear nothing less than marvellous. The ditty of 'the Rule of Three, then puzzles me,' will soon be looked upon as a myth of bygone days, and the name of Long Division as a misnomer. The author is now on a visit to Norfolk for the purpose of selling his work, and has given us—as he is also willing to give to others—a practical illustration of the great value of his improved system of calculation. His book has already been patronised by royalty, and by upwards of 24,000 of the nobility, gentry, professors and merchants."—*Norfolk Times.*

"An eighteenth edition of Mr. O'Gorman's work on *Intuitive Calculations*, making in the whole 24,000 copies—has just been issued of this valuable educational work. This is a great fact, incontestably proving that a publication which received the high sanction of the most illustrious personage in the realm,—Her Majesty the Queen having pronounced it 'a book likely to be of great service in teaching ready calculations'—has obtained, in an almost unexampled manner, the warm encomiums of the metropolitan and provincial press—and which has been patronised by the bankers, gentry, and merchants of the kingdom, has also found favour with the great body of the public, for whose benefit it was chiefly designed. All the rules are short, simple, and easily understood; the examples numerous and appropriate, and the whole is of a thoroughly useful and practical character, so that it may be mastered, without much difficulty, by those whose early instruction has been neglected, and may be perused with advantage to the most accomplished arithmeticians. Mr. O'Gorman deserves credit for his industry, and it is satisfactory to know that his talent is meeting with an adequate reward."—*Literary Guardian.*

"In a commercial community like this, a thoroughly practical and facile work on figures and trade calculations, cannot be too highly appreciated. A production of this character is now before the public of this country; and the opinion expressed by merchants, and many of our contemporaries, warrants a recommendation of Mr. O'Gorman's book."—*Newport Merlin.*

"Any work that will simplify the use of figures, and give facility in calculations, must be acceptable to a mercantile community, to whom time is money, and accuracy of unspeaking importance. Mr. O'Gorman appears, in the work before us, to have made a large stride in this direction, and the opinion we express is concurred in by some of the most celebrated commercial notabilities of the day."—*Star of Gwent.*

"A system of arithmetic, under the title of *Intuitive Calculations*, is now published, and has already reached its eighteenth edition. The system has been spoken of by high and competent judges, as the best ever published—both for clearness and accuracy. The work is of the greatest value to all engaged in mercantile pursuits."—*Cambrian.*

"From the few examples we have studied, we have no hesitation in saying Mr. O'Gorman's system must prove of infinite advantage in rapid calculation, and an immense waste of time will be avoided. We observe testimonials of the press from almost every part of the kingdom which Mr. O'Gorman has visited, and the fact of his work having attained an eighteenth edition of 24,000 copies, demonstrates that the praise bestowed upon it is not unmerited."—*The Welshman.*

"We have seen a system of arithmetic, which its author, Mr. O'Gorman, has entitled *Intuitive Calculations*. It has attained an eighteenth edition, and is accompanied with a body of commendatory notices from competent judges, who have tested the value of the work. The system appears to us to possess the double merit of clearness and conciseness; and will, doubtless, greatly facilitate arithmetical operations."—*Swansea Herald.*

"After a necessarily cursory glance at Mr. O'Gorman's work, we are enabled to state that it appears to be ingenious, and well-adapted to aid persons in rapidity of calculation, by giving them concise and tolerably easy rules, which materially shorten many arithmetical processes that are usually of a lengthy character. As the object of the ingenious author is evidently a saving of time and labour, he may surely congratulate himself on having attained that result."—*Bristol Times.*

INTUITIVE CALCULATIONS.—"A work on this subject has been published by Mr. O'Gorman, a gentleman who recently visited this neighbourhood. The old system of arithmetic is metamorphosed, and the system of calculations is such, that every person engaged in business should be acquainted with it. A more valuable work for the trading community could not be published, and we cordially recommend it to them."—*Oxford Gazette.*

"We have received copies of two works from the pen of D. O'Gorman, entitled respectively, *Intuitive Calculations* and *A New and Comprehensive System of Self-Instructing Book-keeping*. In our case, these works have caused two very different feelings to manifest themselves. Viewing the superior facilties which Mr. O'Gorman's system afford for compassing, in the shortest possible time, the largest amount of arithmetical knowledge, we have given way to the regret that he did not live *some score years earlier*. We can now appreciate what an amount of laborious exercises would have been spared to the stock of our mental energies. Such were the reflections that first presented themselves; but the selfishness of the thought soon gave way to the more generous one, that the present race of learners may, if they are wise, find an easier path, and a more 'royal road' to arithmetic than we had in our younger days to traverse. We do not now speak of Mr. O'Gorman's treatises as those just ushered into light, although not until lately has our attention been drawn to them; still they have been for some time before a large portion of the public. Mr. O'Gorman being one of those who think that business is never as well performed by a deputy as it is by the principal himself in person, he has but recently visited Sheffield. 'Every author his own bookseller' is strikingly exemplified in the present case. As far as Mr. O'Gorman has published himself, the highest praise has been bestowed on the merits of his treatises: the Arithmetic has already reached an eighteenth edition, and although late, still we are glad, even now, to add our testimony to the value of his labours."—*Sheffield Free Press.*

"Being anxious at all times to forward works of a useful character, we have great pleasure in recommending to our readers, O'Gorman's new *Intuitive Calculations*, believing as we do, that the work is one of the most valuable acquisitions that has yet been produced in reference to the branch of education on which it treats. Mr. O'Gorman has succeeded in simplifying arithmetic, so as to render it easy of acquisition by the humblest

capacity, without the aid of a teacher. Abbreviating the process of education is one of the advantages which may be calculated upon in these days of improvement. There are few who have passed their pupilage who will not have felt they have been led through a long and intricate path. Their grammar and spelling-books were dry and tedious productions; so were their arithmetics. Each has undergone various simplifications, and the young student has had a view of the thorns cleared from his track, which, however, in some important branches of education is yet beset with many difficulties. We are glad that another successful experiment has been made by the author of the above work, whose system has drawn forth the highest encomiums from preceptors of undoubted respectability. The work has passed through eighteen editions, and 24,000 copies have already been circulated."—*Huddersfield Examiner.*

"If there is one thing more than another in which the youthful mind is tampered with at school, it is in the intricate and laborious calculations imposed upon it, regardless either of the imperfect knowledge that must necessarily be imparted, or the distaste that must inevitably be produced by such a system. We know of no more important element in the education of the young than the science of arithmetical calculations, not only tending as it does to impart a knowledge upon which must depend the future success of the man in a business and commercial point of view, but as well to induce a habit of thought and a power of deduction in regard to principles and things affecting his moral and social welfare. To prepare the mind effectually for this result, it is essential that the medium of imparting such knowledge should be reduced to the greatest possible degree of simplicity both in thought and expression; and it is the achievement of this purpose that entitles Mr. O'Gorman to the thanks of the community. The work has already passed its eighteenth edition, and we think no greater proof of its merit can be required, although we may add it comes before the world with the especial recommendation of royalty itself, Her Most Gracious Majesty having been pleased to accept a copy of the work, and caused to be forwarded to Mr. O'Gorman a testimonial of her approval of 'its great service in teaching ready calculations.' Mr. O'Gorman is now in this town, with a view of extending the sale of his book, and we have little doubt he will meet with that success which has attended his efforts in other large and important towns."—*Plymouth Mail.*

"Every one who entertains a recollection of the labour which the mastery of the arithmetic in use in public schools entailed on his youth, will welcome the appearance of Mr. O'Gorman's work with extreme satisfaction. He has rendered the science of numbers extremely plain and simple, and has produced a work which will not only greatly facilitate the study of arithmetic amongst the youth of the kingdom, but will prove of immense value in the counting-house or behind the counter. It must have been a matter of no small gratification to the author, as it is a high honour to receive from Her Majesty the Queen, an intimation of her high approval of the work, and that she has extended to it her royal patronage; but in addition to that he has received from the public the striking proof of their warm appreciation of its merits by calling for eighteen editions amounting to 24,000 copies, in the short period since its first publication."—*Plymouth Journal.*

"The object of this book is to supply methods of concise calculation for

all classes of business transactions, such as are not taught in the ordinary books of arithmetic, but are constantly wanted in the counting-house. It comprises in the first place, a very complete set of tables of coins, weights, and measures, both of our own and of other countries; and secondly, supplies to the man of business tables and rules for the rapid calculation of almost every kind of account that can occur. It is surprising that something of this kind should not have been attempted before on the extensive plan which is here carried out, as almost every accountant is in practice perpetually compelled to desert the ordinary tedious methods given in the common books of arithmetic, and to have recourse to some such processes as are here set forth in full and complete detail, in order to shorten and facilitate his work. Mr. O'Gorman's work seems to be admirably calculated to supply a want that must have been long felt by men of business, and every counting-house, we think, ought to have a copy. That the book has been pretty well appreciated, is proved by the circumstance that the copy which lies before us is of the eighteenth edition."—*West Briton.*

"We have been shown a book containing an exposition of a new and concise method of arithmetic, which appears at a cursory glance, to present great advantages over the system now in use. The author of the work is Mr. O'Gorman; and as a proof of its popularity, we may state that it has reached the 18th edition and that as many as 24,000 copies have been sold. By the study of this work the old-fashioned and complex system of arithmetic may be entirely discarded, and a much more simple one substituted in its stead."—*Essex Gazette.*

O'GORMAN'S INTUITIVE CALCULATIONS.—"For the superior character of this volume, it will suffice to point to the fact of its having been introduced into upwards of 500 schools, and to state that it has already reached its 18th edition. To all to whom the saving of time and labour is an object—instructors, pupils, merchants, shopkeepers, &c.,—the work must be invaluable."—*Dover Telegraph.*

"Mr. O'Gorman's work will be found of the greatest use in facilitating mental calculations, as well as making the student familiar with the ordinary arithmetical processes. The copious tables of coins and exchange, and for the reduction of weights and measures, add greatly to the value of the treatise. We do not wonder that this little work, which has attracted the commendation of royalty, should have, as we are glad to learn it has, become extensively popular."—*Northern Whig.*

"The process of arithmetic, formerly so tedious and complicated, has been wondrously simplified within the last half century; and the *Intuitive Calculations* of Mr. D. O'Gorman adapt the various improvements in so happy a manner that, when combined with the additions which may claim originality, there appears truth in the Author's representation—that it is 'the readiest and most concise method ever published.' It is certainly very concise and ready, and he has cause to be proud of the little work. Arithmetical results are obtained by it with almost algebraic quickness. The manual is a very useful one."—*Sharpe's London Magazine.*

TESTMONIALS.

Royal Mint, London, June 28th, 1857.

DEAR SIR,—I have read with great pleasure your last edition on calculations, the easiest and the best I have ever met with. I have shown it to my friends, engineers, and moneyers, who are all unanimous in pronouncing it the most useful book they have ever seen.

Mr. D. O'Gorman,
13, Smithy Door, Manchester.

WILLIAM BUCKLE,
Royal Engineer.

Nautical Almanac Office, 3, Verulam Buildings,
Gray's Inn, July 15th, 1857.

DEAR SIR,—Accept my thanks for the copy of the eighteenth edition of your *Intuitive Calculations* you were kind enough to send me. It is certainly a departure, in the right direction, from everything of the kind which has preceded it. The whole book bears indelibly the stamp of originality, and its usefulness in the ordinary business matters of life is strikingly apparent. The rules are written in a clear and pleasing manner, which, with the various notes, are exceedingly well calculated to create that feeling of interest so essential to the acquisition of commercial knowledge. Large as has been the sale of the work up to the present time, it falls short of what its merits deserve.

I am dear Sir, faithfully yours,

RICHARD FARLEY, F.R.A.S.,

Chief Calculator in the Nautical Almanac Office, London.

Mr. D. O'Gorman,
13, Smithy Door, Manchester.

Cambridge Observatory.

DEAR SIR,—I have carefully examined the eighteenth edition of your *Intuitive Calculations*, and have great pleasure in bearing testimony to the ingenuity of your rules, which produce such brevity in operation. You have arranged a system that must render great and important service to the mercantile community, as well as to the rising generation, notwithstanding that many have grappled with the subject of which you treat. Some brought out works obscurely written; whilst others were found

more cumbrous than even the common routine; but the ease with which you arrive at conclusions, and the concise and clearly-developed rules, as well as the simplicity of your methods, belong to a different order, and must be incalculably invaluable in the various mercantile pursuits in life. No branch of mercantile calculations appear to be overlooked in your treatise, and the brevity with which you calculate the most minute fraction, at once show that you were fully competent for the work you had undertaken. Indeed, I do not wonder at the numerous list of subscribers that fill your pages; and, I have no doubt, the more your book is known, the more will the public appreciate the services you have rendered to the busy part of mankind.

Wishing you every success,
I am, Sir, respectfully yours,

JAMES BREEN.

Mr. Daniel O'Gorman,
13, Smithy Door, Manchester.

SIR,—The Committee of the Manchester Free Library and Museum have received your book on *Intuitive Calculations*, and request me to return you their best acknowledgments and thanks.

I have the honour to be, Sir,
Your most obedient Servant,

JOHN POTTER, M.P.,
Chairman.

Mr. D. O'Gorman,
13, Smithy Door, Manchester.

Glasgow Athenæum.

DEAR SIR,—I have carefully examined your work on concise calculation, and have no hesitation in bearing my humble testimony that it is incomparably the easiest understood, and by far the most complete of any work hitherto published on the subject. I am sure it only requires to be known to be placed in every office and counting-house in the United Kingdom: it is also adapted for a *class-book* in every public and private school, as its simplicity renders it of incalculable value to the student. In the hands of fathers and mothers, their children can progress with ease and facility in the solution of numerical calculations, by its plain and unerring guidance. I shall merely repeat that your little book is the most complete important, easy, and useful work that has ever issued from the press on the subject of concise arithmetic.

Wishing you a long life to exercise your genius and talents for the benefit of mankind,

I remain, dear Sir, faithfully yours,

JAMES Mc KENNA,
Vice-Chairman of the Board of Directors of the Glasgow Athenæum.

Mr. D. O'Gorman,
13, Smithy Door, Manchester.

Charlotte Square, Newcastle-upon-Tyne.

I have carefully looked through Mr. O'Gorman's admirable little treatise on arithmetic. Its tables are of the most useful description. Its rules are given with clearness and precision, and constitute it the very best manual I have seen of rapid and expeditious calculations. Portions of it show that Mr. O'Gorman has sounded the depths of the profoundest parts of Arithmetical science. I have been delighted with his book, and sincerely hope that its sale will be in exact proportion to its utility; and then, if the author be not remunerated sufficiently for the usefulness and clearness of his labours, there is no truth in the most golden rule of the important science, to the elucidation of which he has directed his talents.

Mr. D. O'Gorman,
13, Smithy Door, Manchester.

CHARLES LARKIN, M.D.

Lancashire and Yorkshire Railway,
General Manager's Office, Manchester.

DEAR SIR,—I duly received a copy of your new *Intuitive Calculations*, and I can assure you, the methods adopted therein are far beyond what I expected. A good knowledge of the tables, I find, is all that is required to glide easily into the midst of calculations, which, except by your ingenious invention, would be most tedious and cumbersome. I am very much interested in your book, and glad to find you have such extended patronage among railway managers and clerks. Your rules for calculating the carriage of goods and clearance house, must be invaluable in that department, the adoption of which will greatly lighten the drudgery subject thereto; and the sooner your system is adopted in such places the better. In fact I find nothing omitted in general use for the business man.

I have only to add that I wish you success, and glad to find you are gone to press with a new edition.

I am, dear Sir,

Very truly yours,

M. F. FENNELLY.

Mr. D. O'Gorman,
13, Smithy Door, Manchester.

ADVICE TO YOUNG MEN.

"Good rules acted upon are the sinews of character."

My dear Friends,—Read, mark, and digest the following lines: they were written for the benefit of young men, and it is hoped many will profit by them.

First.—Observe strict integrity in all your conduct. Never make a promise which you have not a reasonable prospect of fulfilling; and, when once made, use every exertion in your power to accomplish it. To be successful in the performance of your duties, *first learn to do everything well, then learn to do it in the least possible time;* by continued and persevering efforts, both will become easy and habitual to you, and the habits thus formed will be of incalculable benefit through life. Make it a matter of principle to discharge all the duties assigned you to the best of your ability; endeavour to do more than is expected of you, rather than less, for by so doing, you will not fail to acquire the confidence and respect of your employer. If you find that you cannot accomplish all that he may require of you, notify him thereof in season, that his expectations in regard to you may not be disappointed, nor his business unnecessarily retarded, and your own credit will thereby be saved.

Second.—As we become attached to those who take pleasure in our business, and in promoting our interest, it may be received as a maxim, that the more you are doing for your employer, the more you are doing for yourself; as by that means you are perfecting your own usefulness, and increasing his favourable opinion of you, to deserve which, should be your constant aim, and which will, in after life, be to you a source of much credit and satisfaction, and often of very great advantage.

Third.—At all times show proper respect to your employers and superiors in station, and take pleasure in obliging them. Keep the secrets of your employers *inviolate;* relate none of his business to *his* or *your* most intimate friends; it would be

manifest treason on your part to do so; besides, too, it is as much his property as the money in his drawer. Your time is the property of your employer; do not, therefore, absent yourself during the hours of business without his permission.

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THE AUTHOR.

Manchester, 1857.

ADVERTISEMENT.

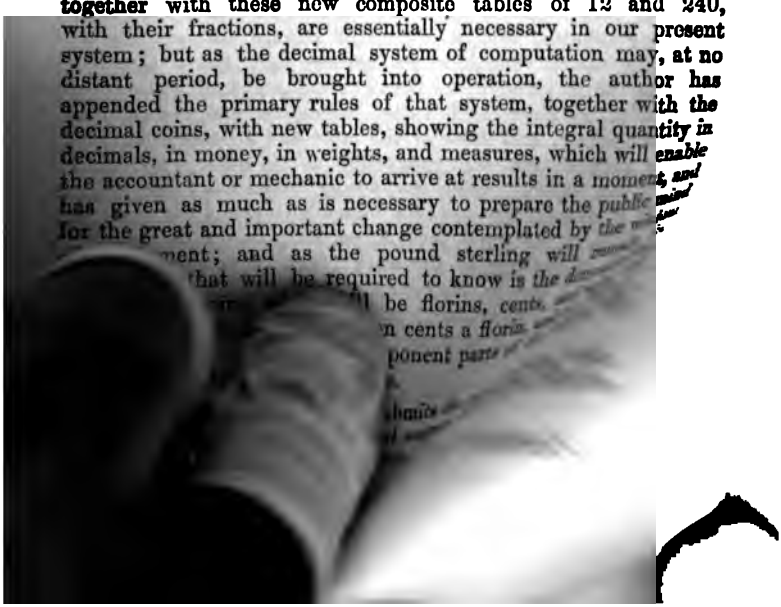
THE extensive sale, and still pressing demand, for the new *Intuitive Calculations*, obliges the author to meet the anxious wishes of the numerous public who have so liberally patronized him in the sale of the nineteen former editions, and therefore he requires little apology in introducing a twentieth.

To the present edition many useful rules are added, and new discoveries made in the application of figures, which the Philomath, the man of genius, and the mercantile man, will find well calculated to assist him in transacting the ordinary business of the day with accuracy and despatch, and in the tenth part of the time usually required or laid down in the common school arithmetics, and all so plain and intelligible, that the plan of operation is brought under the comprehension of the weakest capacity, and if not convenient the system can be acquired in ten or twelve weeks without the aid of a master. Neither pains nor expense have been spared in rendering the present edition of the greatest importance to the merchant, the mechanic, the accountant, and the tyro, who wish to become smart and ready calculators, no matter how difficult the transaction, and all with such facility and precision as to ensure a correct result. All that is required is a perfect knowledge of the tables to put the plan in operation, and should an error be committed, the system is so [illegible] discovered, and an easy co[rrection] a side of figures, usual in

It is acknowledge[d] nay, some [illegible] entering into [illegible] and take [illegible] totti[ng] wo[rk] th[e]

To the nobility, gentry, professors, teachers, merchants, and traders, he tenders his warmest thanks and acknowledgment for their liberal support; and the sincere wish of his heart is, that each and every one into whose hands the present edition may fall, will reap the benefit intended by him.

As the tables are of the greatest importance, and in fact may be called the buttress of all calculations, we would beg the most serious attention of our young friends to study them with accuracy, and not only that, but to commit them to memory, and to observe the general rule laid down by a judicious author, "*that anything well known should not be too long dwelt upon, nor anything imperfectly known passed over.*" The simple and compound rules, with their variations, being well understood, the calculations after become simple, and all mercantile transactions rendered familiar, the principle being based on two numbers, 12 and 240; 12 pence being a shilling, and 240 pence a pound, these two numbers are, of course, applied in all cases, according to our present computation; 12 being brought up to 240 by an equation, with the smallest fraction, and 240 to infinity in a similar manner. A perfect knowledge of the money tables, together with these new composite tables of 12 and 240, with their fractions, are essentially necessary in our present system; but as the decimal system of computation may, at no distant period, be brought into operation, the author has appended the primary rules of that system, together with the decimal coins, with new tables, showing the integral quantity in decimals, in money, in weights, and measures, which will enable the accountant or mechanic to arrive at results in a moment, and has given as much as is necessary to prepare the public mind for the great and important change contemplated by the [illegible] ment; and as the pound sterling will [illegible] that will be required to know is the [illegible] be florins, cents [illegible] n cents a florin [illegible] ponent parts [illegible]



INTRODUCTION.

As the common arithmetics of the day contain much matter with which there is no absolute necessity that every pupil should make himself acquainted; and as these books generally fall into the hands of those who have no time to waste in attaining ready calculations, this work, indiscriminately, is intended to assist them in the accomplishment of so desirable an object. We have, therefore, carefully studied what course should be laid down in a matter of such importance, and we trust the rules and examples will be found to suit the object in view, viz.,—the rapid improvement and easy access of the pupil to ready calculation. We venture to assert that, in the following treatise, such a system of science and practice will be found, as to convince our readers they never met with anything more suitable to their avocations and wants. We purpose to lay down such rules, principles, and systems, that every schoolboy, and those of the most dull apprehensions, will receive such benefit and instruction as no other work on the subject can afford. After our young friend has made himself master of numeration and its dependent principles, we then recommend to his most serious perusal, the definitions and tables in the first part of the work: these, if properly attended to, will serve him in the whole course of his studies. Many excellent accountants have been wandering in the dark, merely through want of such assistance. If the pupil's time and genius afford the opportunity of committing to memory our demonstrations, so much the more will he profit; but if these favourable circumstances occur not, then let him carefully attend to the tables; and we assert, roundly, so complete a set of tables, of coins, weights, and measures, were never before published; a perfect knowledge of which will serve every student, be his intended profession what it may. In the whole, the system will be found of the greatest importance, and the pupil, there-

fore, according to his ability and taste, should attend to it closely, and make it his study never to pass over any rule without knowing its meaning, nor dwell too long on any case perfectly understood.

Surely, short and easy methods in accounts give the pre-eminence; and, indisputably, this system contains more thereof than any other before published. The simple rules are laid down in a manner not hitherto given by any author; and what is commonly called *Long Division*—a rule occupying so much time and difficulty to the learner, and trouble to the teacher—is illustrated by examples, showing the quotient in one line at the bottom, like *Short Division;* thus saving much time and labour to master and scholar. In the compound rules will also be found many useful hints and methods, entirely suited to the business of the day, and well worthy of perusal; and these methods, when fully understood by the pupil, will qualify him to pass through the general routine of business with that adroitness and facility with which every one aspiring to become a good accountant should make himself acquainted.

From these general observations on the work, we apprehend our readers will be better qualified to go through the system than if left entirely to their own judgment. True, indeed, the work speaks for itself; but still we think there is an absolute necessity in pointing out the improvements and originality in which our system exceeds others, in directing the attention more fully to those advantages so necessary both in theory and practice.

We hope that the judicious teacher, who has his pupil's interest at heart, will carefully direct him to study these short rules and methods with the most ardent attention, and that neither prejudice nor long contracted habits will prevent him from at once introducing a system that will be creditable to himself and beneficial to the youth committed to his care, which he must see, will assist the pupil in his ordinary concerns in after life, and give him a taste in the meantime for proficiency in numbers, which nothing but such brevity of operation could produce.

Teachers will find this work of the greatest importance to themselves and scholars. The number of examples suited to all ranks and professions, with the shortest methods possible of solution, and the whole deduced from rational principles, will leave nothing wanting for their use and information.

Foreign exchanges by the chain rule are copiously given at the end of the work, which will be found of great utility to merchants and traders who reside in seaport towns, and who transact business with foreign nations. The appendix on decimals, with the new tables, showing the integral quantity in decimals, money, weights, and measures, will also be found interesting. No business man ought to be without a knowledge of computing by this useful and expeditious method; and it is to be hoped many will avail themselves of the system we lay down. In fact, neither labour nor expense has been spared to render the work worthy of the highest patronage royalty could bestow, with which it was honoured on its first appearance; nor has anything been omitted to promote the accession of the present edition into every counting-house, office, and school in the united kingdom. The author, therefore, presumes on the continued support of an enlightened public; and if nothing accrue but the diffusion of his plan of ready calculations throughout the rising generation, he rests quite satisfied his readers will benefit by it, and he will have attained his object.

THE AUTHOR.

Manchester, 1858.

INTUITIVE CALCULATIONS.

DEFINITIONS.

1.—Calculation is a method which teaches how to apply the relation of numbers one to another, and by them deduce precepts of computation relative to the affairs of the busy part of mankind. And, in reality, there are but two primary operations, from which the rest are all branches, viz.,—Addition and Subtraction, as will be clearly demonstrated. Multiplication is but a contracted method of Addition, and Division a contracted mode of Subtraction

2.—The most part of the objects of our knowledge may be said as being capable of augmentation and diminution; and our ideas of things, as far as they have that tendency, are what we call quantity, by which word may be comprehended whatever can be properly said to have parts. Under this definition we may class extension, weight, motion, time, &c. The one being taken, greater or less, heavier or lighter, swifter or slower, in proportion to one another of the same kind; and, since the primary property of quantity is the being capable of more or less, quantities may be added to, subtracted from, or multiplied by one another, and consequently divided into the parts they contain.

3.—Unity is a quantity, which is determined in order to be represented, or to be divided into parts: in the first case it is called integral, in the second fractional: as a bushel of oats, or 6 bushels, &c.; $\frac{1}{4}$ of a bushel; an $\frac{1}{8}$, &c. Here the two integrals are separated by 1 and 6, and the two fractions by $\frac{1}{4}$ and $\frac{1}{8}$.

4.—Number is many composed of units.

5.—A number is said to measure another, when the lesser being taken a number of times, is exactly equal to the greater, as 8 measureth 24, because 3 times 8 make 24. Unity measureth all numbers.

6.—One number is a multiple of another, when the less measureth the greater, or when the greater containeth the less a number of times exactly.

7.—An aliquot part of a number is that which measureth the said number without a remainder. The number 2 is an aliquot

part of 10, being taken 5 times; but 3 is an aliquant part of 10, because it does not measure 10 without a remainder. Therefore any number that measures another number without a remainder, is called an aliquot number; and any number that does not exactly measure another number, is called an aliquant number.

8.—Numbers consist of digits, articles, compounds, whole, broken, mixed, &c.

9.—Numbers are equal, unequal, even, odd, evenly even, evenly odd, oddly odd, composite, plain, solid, perfect, harmonic, square, cube, &c., &c.

10.—Equal numbers are such as contain an equal number of units.

11.—Unequal numbers are those whose number of units differ.

12.—An even number is that which may be divided into two equal parts.

13.—An odd number is that which cannot be divided into two equal parts.

14.—A number evenly even, is that which an even number measureth by an even number; such is 24, which is the even number 6 measured by the even number 4.

15.—A number evenly odd, is that which an even number measureth by an odd number: such is 12, when the even number 4 measures by the odd number 3.

16.—A number oddly odd, is that which an odd number measureth by an odd number: such is 21, which an odd number 7 measureth by an odd number 3.

17.—A composite number is that which some certain number besides an unit measureth, and consequently hath several aliquot parts: such as 4, 6, 8, 10, 12, 14, 16, and infinite others.

18.—Plain numbers are such as are made of the multiplication of two, as 6×2 are 12.

19.—A solid number is that which is produced from the multiplication of three numbers; and the numbers that multiply one another are called the sides of the solid number; consequently every solid number is composite. 24 is a solid number, because it is made by the multiplication of three numbers, 2, 3, and 4; for $2\times3=6$, and $4\times6=24$.

20.—Perfect numbers are such, whose aliquot parts added together are equal* to themselves: as 6, whose parts are 3,

* If a series of numbers continually proportionate from unity in a duplicate ratio be continued until their sum be a prime number, the sum being *multiplied* into the greatest term, shall produce a perfect number. Hence,

2, 1=6. The second perfect number is 28; for all the aliquot parts thereof are 1, 2, 4, 7, 14, which, added together, make 28.

21.—Harmonic numbers are such, that the aliquot parts of the one collected are equal to those of the other.

22.—A square number is that which is made by the multiplication of two equal numbers; or by the multiplication of any number by itself, which is called a square root. The first square in whole numbers is 4, which is made by multiplying 2 into itself; the second is 9, which is found by 3×3 and so on to infinity.

23.—A cube number is that which is made by the multiplication of three equal numbers; the number itself is called a cube root. The first cube except 1 is 8, which is found by the multiplication of 2 thrice taken: 2×2=4 and 4×2=8. The second is 27, which is made by the multiplication of 3 taken thrice, as 3×3=9 and 9×3=27.

24.—In numbers, the ratio or proportion is the mutual habitude of two numbers to one another, and is twofold, either in respect of quantity or quality. In respect of quantity, it is considered between two numbers; the first called the antecedent, the second the consequent, and is equal, as 3 to 3, or unequal as the greater to the less, 6 to 4, or the less to the greater, 4 to 6.

In respect of quantity, which produce a similitude of reasons called proportion, it is considered between more than two numbers; for though the reason of two numbers, may be had as before, yet a similitude of reasons cannot be found, unless the numbers be more than two, and is threefold. First, in respect of their difference; second, of their quote; third, in respect of both.

Of the first, ariseth Arithmetical proportion; of the second, Geometrical proportion; of the third, Harmonical proportion.

A Theorem is a proposition whose truth is to be demonstrated.

A Problem is a proposition of something to be done or discovered.

A Lemma is a Theorem, instructive to some subsequent proposition, to shorten the proof or practice of it.

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by the above, may be found all the perfect numbers; because the sums of 1 and 2 are 3, a prime number, $3 \times 2 = 6$, the first perfect number, whose aliquot parts are 1, 2, and 3; and because the sums of 1, 2, and 4, are 7, a prime number, 7 multiplied by the greatest aliquot part 4, make 28, the second perfect number, whose aliquot parts are 1, 2, 7, and 14. Again, the sums of 1, 2, 4, 8, and 16, are 31, a prime number $= 31 \times 16 = 496$, the third perfect number. The aliquot part of the next are 1, 2, 4, 8, 16, 31, 62, 124, 248.

A Corollary is a proposition gained by one whose truth is evident from the truth or demonstration of another.

A Demonstration is an infallible proof of the truth or falsity of propositions.

AXIOMS.

1.—Those things which are equal to the same thing are equal to one another.

2.—If equals be added to equals, the whole will be equal.

3.—If equals be taken from equals, the remainder will be equal.

4.—If equals be multiplied by equals, the product will be equal.

5.—The whole is equal to all its parts.

A Postulate is something granted on which to found a proof.

An Axiom is a proposition whose truth is self-evident.

A Proposition is whatever is affixed or proposed, either as matter of assent, practice, or speculation.

Propositions are divided into Theorems, Problems, Lemmas, and Corollaries.

Numeration is the first principle part of Computation, and teaches how to read, write, value, or express any number of figures, and consists of two parts.

1.—The due order of setting down figures.

2.—The value of each figure in its proper place.

NOTATION AND NUMERATION TABLES

Are the first parts of Arithmetic and shows how to note down, enumerate, and read the value of numbers.

PLACE																		
1st.—Units*	...	...	...	...	...	...	1	1	1	1	1	1	1	1	1	1	1	Units.
2nd.—Tens	...	...	...	...	...	...	2	2	2	2	2	2	2	2	2	2	2	
3rd.—Hundreds	...	...	...	...	...	...	...	3	3	3	3	3	3	3	3	3	3	
4th.—Thousands	...	...	...	...	...	...	...	...	4	4	4	4	4	4	4	4	4	
5th.—Tens of Thousands...		...	...	...	...	...	...	...	...	5	5	5	5	5	5	5	5	
6th.—Hundreds of Thousands			...	...	...	...	...	...	...	...	6	6	6	6	6	6	6	
7th.—Millions	...	...	...	...	...	...	...	...	...	...	...	7	7	7	7	7	7	Millions.
8th.—Tens of Millions		...	...	...	...	...	...	...	...	...	...	8	8	8	8	8	8	
9th.—Hundreds of Millions			...	...	...	...	...	...	...	...	...	9	9	9	9	9	9	
10th.—Thousands of Millions				...	...	...	...	...	...	...	...	1	1	1	1	1	1	
11th.—Tens of Thousands of Millions					...	...	...	...	...	...	...	2	2	2	2	2	2	
12th.—Hundreds of Thousands of Millions						...	...	...	...	...	...	3	3	3	3	3	3	

* The first period is called Units, the second Millions, the third Billions, the fourth Trillions, the fifth Quadrillions, &c., and so on to Quintillions, Sextillions, Septillions, Octillions, &c.; and when the pupil can read one period well, he may read any length of figures whatever.

13th.—Billions, or Millions of Millions	4	Billions,
14th.—Tens of Billions	6	
15th.—Hundreds of Billions	6	
16th.—Thousands of Billions	7	
17th.—Tens of Thousands of Billions	8	
18th.—Hundreds of Thousands of Billions	9	
19th.—Trillions	1	Trillions,
20th.—Tens of Trillions	2	
21st.—Hundreds of Trillions	3	
22nd.—Thousands of Trillions	4	
23rd.—Tens of Thousands of Trillions	5	
24th.—Hundreds of Thousands of Trillions	6	
25th.—Quadrillions	7	

NOTATION BY LETTERS.

I. ... ... One	XII. ... ... Twelve	L.	Fifty
II. ... ... Two	XIII.... ... Thirteen	C.	One Hundred
III.... ... ... Three	XIV.... ... Fourteen	D.	Five Hundred
IV.... ... ... Four	XV. ... ... Fifteen	DC.	Six Hundred
V. ... ... Five	XVI.... ... Sixteen	M.	One Thousand
VI.... ... ... Six	XVII. ... Seventeen	$\overline{V.}$	Five Thousand
VII. ... ... Seven	XVIII. ... Eighteen	$\overline{X.}$	Ten Thousand
VIII. ... ... Eight	XIX.... ... Nineteen	$\overline{L.}$	Fifty Thousand
IX.... ... ... Nine	XX. ... ... Twenty	$\overline{C.}$	One Hundred Th.
X. ... ... Ten	XXX. ... Thirty	$\overline{D.}$	Five Hundred Th.
XI.... ... ... Eleven	XL. ... ... Forty	$\overline{M.}$	One Million

ADDITION.

ADDITION of whole numbers is the second essential point of computation, and teaches of several numbers of the same denomination to make one total, called their sum.

RULE.—Set down all the numbers to be added, write no figure in the same column that is not of the same value or place, then draw a line under them.

2.—Begin at units place, add up that column, and find how many tens are contained therein.

3.—Set down what remains above the tens, or, if nothing remain, write down a cipher, and carry* as many ones to the next column as there were tens in this.

4.—Proceed with the second column in like manner, and so on till all be finished.

* REASON FOR CARRYING ONE FOR EVERY TEN.—Because ten units in the first column towards the right hand make an unit in the next row towards the left; therefore the reason for carrying one for every ten is evident; and the method of placing the figures is no less true, because any other arrangement of them would alter their value. This rule is founded on the known axiom "the whole is equal to all its parts." (Axiom 8.)

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we would say, let it be your strong and abiding determination to become master of your art or calling, whatever it may be. Study it deeply, and in all its branches. Resolve to be ignorant of nothing that pertains to it. Strive to acquire despatch with cleverness in performing all its duties, from the most trivial to the most momentous. This habit you will not fail to acquire, if you make it a rule to do everything in the best and quickest way you possibly can. Many a bungling, good-for-nothing workman, has become such, not for want of capability, but for want of desire to excel, which has led him to contract the habit of doing everything in a careless, slovenly manner. Be not satisfied with learning your business by rote, and of attaining that manual dexterity which careful practice will ensure; but endeavour to form comprehensive views of the nature of your profession. Examine and become familiar with the scientific principles on which it is founded. This will teach you the best method of conducting the operative part of it; it will enable you to account for strange appearances, and to deal with new cases, of which, if you are ignorant, would be inexplicable and embarassing. And there is scarcely any department of manual occupation, however mean, which does not involve philosophical principles, the knowledge of which it is, therefore, the interest of all workmen to obtain.

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Manchester, 1857.

manifest treason on your part to do so; besides, too, it is as much his property as the money in his drawer. Your time is the property of your employer; do not, therefore, absent yourself during the hours of business without his permission.

Fourth.—Never permit others to injure your employer, or abuse his confidence, without giving him notice, for your own character is concerned in it as well. When sent an errand, or requested to attend to any special duty, use *despatch*, and make a report immediately on the performance thereof; as it frequently happens that matters of importance are connected therewith, which may require immediate attention.

Fifth.—Let the duties of each day be regularly performed even if extraordinary effort be necessary. Do everything in its proper season, and postpone nothing which you can conveniently attend to. Undertake but *one* thing at a time, and pursue it, if possible, till accomplished. Let there be a distinct and separate place for everything, and keep everything in its place.

Sixth.—Keep an account of your expenses, and economise your money as well as your time: your future happiness and respectability will depend, in a great measure, on the proper use of both. The celebrated Duke de Sully, the great French statesman, ascribed his success in life to the strict economy observed in his youth. Should you meet with difficulty in the performance of your duties, do not be discouraged on that account, for you will overcome them all by perseverance. A sound and discriminating judgment is particularly necessary in buying and selling. As the skill of a physician consists in ascertaining the precise nature of a disorder from the symptoms it presents, and as this skill cannot be acquired without diligent and extensive observation, in like manner the cleverness of a tradesman chiefly consists in being able keenly and correctly to perceive the value of the article in which he traffics; nor can this acuteness be obtained without vigilant attention, or, in other words, without considerable mental exertion.

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CASE 6.

To multiply any number of figures without the aid of intermediate lines.

RULE.—Multiply the units of the multiplicand by the units of the multiplier; set down the units of the product and carry the tens: next, multiply the tens of the multiplicand by the units of the multiplier, to which add the product of the units of the multiplicand, multiplied by the tens in the multiplier, and the tens carried; then multiply the hundreds in the multiplicand by the units of the multiplier, adding the product of the tens in the multiplicand, multiplied by the tens in the multiplier, and the units in the multiplicand by the hundreds in the multiplier, and so on till you have multiplied by every figure in the multiplier.

EXAMPLES.

1.—Multiply	4765483	2.—9876547	3.—5837654
by	379	5678	3765
Ans.	1806118057	56079033866	21978767310

PROOF. 6 / 2 × 3 / 6

4.—Multiply	76543208	5.—61037047	6.—84019073
by	4073	36105	70906
Ans.	311760486184	2203742581935	5957456390138
7.—Multiply	76547861	8.—54013706	9.—86785432
by	35798	50917	70169
Ans.	2740260328078	2750215868402	6089646978008

QUERIES.—What is Simple Multiplication? How many given numbers has it? What are they called? How are they to be placed in order to be multiplied? What is the answer in Multiplication called? What is a composite number? How do you multiply by a composite number? When you have ciphers intermixed, how do you manage them? When to the right hand of multiplicand or multiplier what should you do with them? How is Multiplication proved? Repeat the rule for multiplying by any number of figures without intermediate lines.

SIMPLE DIVISION.

CASE 1.

DIVISION is the finding how often one number is contained in another. The number to be divided is called the dividend; the number you divide by, the divisor; the number found, the quotient.

RULE.—Set down your dividend, to the left of which place your divisor with a parenthesis between them, and the sign ÷ before; find how often the divisor is contained in the next figure or figures of the dividend. Multiply the divisor by the quotient, subtract the result and carry the remainder to the next dividend, and thus proceed.

METHOD OF PROOF.—Multiply the quotient by the divisor, adding in the remainder; the product will be equal to the dividend if the work be right.

EXAMPLES.

1.	2.	3.
Divide 76438646 by 2.	93765438 by 3.	67432679 by 4.
÷2) ———	÷3) ———	÷4) ———
Ans. 38219323	31255146	16858169 - 3 rem.

4.	5.	6.
Divide 87654327 by 5.	78647859 by 6.	98734210 by 7.
÷5) ———	÷6) ———	÷7) ———
Ans. 17530865 - 2 rem.	13107976 - 3 rem.	14104887 - 1 rem.

7.	8.	9.
Divide 87652398 by 8.	97654378 by 9.	540132765 by 10.
÷8) ———	÷9) ———	10÷) ———
Ans.		

CASE 2.—LONG DIVISION.

An original plan, more concise than either the French, German, or Italian methods; it may be acquired in a few hours. The operation combines an expansion of mind, with a quickness of perception, that will tend to make easy this once tedious and difficult rule.

RULE.—Write down your dividend to the left of your divisor with sign + before it; separate the dividend and divisor as before; draw a horizontal line at a proper distance; find how often the first figure of the divisor is contained in the first figure or two of the dividend; write under the horizontal line as often as it will go; multiply the divisor by the quotient figure; subtract the result mentally from the dividend, casting out the multiplied figures: then, set the remainder in a perpendicular line, to read up with the next figures of the dividend, and so proceed till all be done.

EXAMPLES.

10.

+14)	78	6	5	4	7	6	3	2	
...		8	2	1	2	3	0	5	
		.	.	1	.	1	1	.	
Quot.		5	6	1	8	1	9	7	$3\frac{10}{14}$ rem.

11.

+17)	23	7	8	6	9	5	4	7	
...		6	6	5	3	5	4	0	
		.	1	1	.	.	.	1	
Quot.		1	3	9	9	2	3	2	$6\frac{5}{17}$ rem.

12.

+18)	39	5	8	1	6	4	3	2	
...		3	7	6	7	4	.	.	
		.	1	1	1	1	.	.	
Quot.		2	1	9	8	9	8	0	$1\frac{1}{18}$ rem.

13.

+19)	43	7	6	5	2	7	8	9	
...		5	.	.	8	6	0	3	
		.	.	.	.	.	1	1	
Quot.		2	3	0	3	4	3	5	$7\frac{6}{19}$ rem.

14.

+21) 56|7|8|5|4|6|3|5
...|4.|.|1.|.|0|4
|1.|.|.|.|2|1
Quot. 2|7|0|4|0|6|9|6 1/1 rem.

15.

+26) 58|6|7|1|3|4|5|6
...|6|4|7|5|3.|.
|.|1|1|1|2.|.
Quot. 2|2|5|6|5|9|0|2 4/6 rem.

16.

+28) 31|4|7|8|6|9|7|5|4
...|3|6|1|6|0|5|5|7
|.|.|1.|1|2.|2
Quot. 1|1|2|4|2|3|9|1 9 2/2 8 rem.

17.

+32) 47|6|9|8|7|5|4|6
...|5|8|1.|7|9|2
|1|2|.|.|2|1.
Quot. 1|4|9|0|5|8|6|0 2/3 6/2 rem.

18.

+38) 47|8|9|6|5|4|3|2|9
...
Quot. rem.

19.

+45) 78|6|4|5|2|3|4|7|8
...
Quot. rem.

20.

+63) 78|6|5|4|7|8|6|9|7
...
Quot. rem.

21.

+68) 98|7|6|5|4|7|8|6|8
...
Quot. rem.

22.

+75) 86|9|7|8|6|4|8|6|9
...
Quot. rem.

23.

+84) 78|6|5|4|7|8|6|5|7
...
Quot. rem.

24.

+94) 105|6|7|8|6|9|8|4|7
...
Quot. rem.

25.

+98) 145|6|7|8|6|4|7|4|8
...
Quot. rem.

26.

÷234) 786|7|8|5|4|3|6|5|4
...
Quot. rem.

27.

÷346) 786|9|8|9|8|6|4|2|7
...
Quot. rem.

28.

÷2465) 7869|7|6|5|4|3|2|7|8|
.....
Quot. rem.

29.

÷578) 61543|4|8|3|7|6|9|5|8|
.....
Quot. rem.

30.

÷9876) 58647|8|9|0|1|6|5|7|9|
.....
Quot. rem.

31.

÷24786)78654|7|8|6|9|7|6|8|9|
.....
Quot. rem.

32.

÷10765)87654|8|7|6|5|4|6|8|9|
.....
Quot. rem.

33.

÷27654)98765|7|8|6|4|5|9|7|6|
.....
Quot. rem.

QUERIES.—What is Simple Division? How many given numbers hath it? What do you call the number you divide by? What term do you give the number to be divided? What is the result called? Can you divide by composite numbers? How do you prove Division? Repeat the rule for the new method.

REDUCTION

OF COINS, WEIGHTS, AND MEASURES.

REDUCTION is twofold, viz.,—descending and ascending. First, all great names are brought into small ones by multiplying with so many of the lesser as make one of the greater; second, all small names are brought into greater by dividing with so many of the less as make one of the greater.

To perform by multiplication, reduce the greatest denomination to the next less, adding in the less; reduce this sum to the next lower name, adding the numbers belonging thereto, and so proceed till the lowest.

To perform by division is the converse of that by multiplication: divide the lowest denomination by so many of these as make one of the greater, and so on till the highest.

PENCE, SHILLINGS, AND POUND TABLES COMBINED.

D.		£	s.	d.	D.		£	s.	d.	s.		£	s.	d.
12	are	0	1	0	2000	are	8	6	8	20	are	1	0	0
20	...	0	1	8	2160	...	9	0	0	30	...	1	10	0
24	...	0	2	0	2400	...	10	0	0	40	...	2	0	0
30	...	0	2	6	2500	...	10	8	4	50	...	2	10	0
36	...	0	3	0	2640	...	11	0	0	60	...	3	0	0
40	...	0	3	4	2880	...	12	0	0	70	...	3	10	0
48	...	0	4	0	3000	...	12	10	0	80	...	4	0	0
50	...	0	4	2	3120	...	13	0	0	90	...	4	10	0
60	...	0	5	0	3360	...	14	0	0	100	...	5	0	0
70	...	0	5	10	3500	...	14	11	8	110	...	5	10	0
72	...	0	6	0	3600	...	15	0	0	120	...	6	0	0
80	...	0	6	8	3840	...	16	0	0	130	...	6	10	0
84	...	0	7	0	4000	...	16	13	4	140	...	7	0	0
90	...	0	7	6	4500	...	18	18	4	150	...	7	10	0
96	...	0	8	0	5000	...	20	16	8	160	...	8	0	0
100	...	0	8	4	5500	..	22	18	4	170	...	8	10	0
108	...	0	9	0	6000	...	25	0	0	180	...	9	0	0
110	...	0	9	2	6500	...	27	1	8	190	...	9	10	0
120	...	0	10	0	7000	...	29	3	4	200	...	10	0	0
130	...	0	10	10	7500	...	31	5	0	210	...	10	10	0
132	...	0	11	0	8000	...	33	6	8	220	...	11	0	0
140	...	0	11	8	8500	...	35	8	4	230	...	11	10	0
144	...	0	12	0	9000	...	37	10	0	240	...	12	0	0
150	...	0	12	6	9500	...	39	11	8	250	...	12	10	0
156	...	0	13	0	10000	...	41	13	4	260	...	13	0	0
160	...	0	13	4	11000	...	45	16	8	270	...	13	10	0
168	...	0	14	0	12000	...	50	0	0	280	...	14	0	0
170	...	0	14	2	13000	...	54	13	4	290	...	14	10	0
200	...	0	16	8	14000	...	58	6	8	300	...	15	0	0
240	...	1	0	0	15000	...	62	10	0	400	...	20	0	0
300	...	1	5	0	16000	...	66	13	4	500	...	25	0	0
400	...	1	13	4	17000	...	70	16	8	600	...	30	0	0
480	...	2	0	0	18000	...	75	0	0	700	...	35	0	0
500	...	2	1	8	19000	...	79	3	4	800	...	40	0	0
600	...	2	10	0	20000	...	83	6	8	900	...	45	0	0
700	...	2	18	4	21000	...	87	10	0	1000	...	50	0	0
720	...	3	0	0	30000	...	125	0	0	2000	...	100	0	0
800	...	3	6	8	40000	...	166	13	4	3000	...	150	0	0
900	...	3	15	0	50000	...	208	6	8	4000	...	200	0	0
960	...	4	0	0	60000	...	250	0	0	5000	...	250	0	0
1000	...	4	3	4	70000	...	291	13	4	6000	...	300	0	0
1200	...	5	0	0	80000	...	333	6	8	7000	...	350	0	0
1440	...	6	0	0	90000	...	375	0	0	8000	...	400	0	0
1500	...	6	5	0	100000	...	416	13	4	9000	...	450	0	0
1680	...	7	0	0	200000	...	833	6	8	10000	...	500	0	0
1920	...	8	0	0	240000	...	1000	0	0	12000	...	600	0	0

NOTE.—In the early ages of commerce there was no occasion for computation; one commodity was bartered for another. As civilization advanced, improvements were made, and something was added to the conveniences of trade. To remove the difficulty, gold and silver, being the most precious metals, were universally adopted: but as the expense in the working of gold was much greater than the charge for working silver, the higher value was justly ascribed to the former. It was then found necessary to fix a proportion between these metals; and hence, one ounce of gold was considered worth about fifteen ounces of silver: however, it was soon found necessary to impress coins with a mark of distinction, expressing the value each piece contained. The pound troy was selected as the standard to regulate the money of this realm. Two centuries before the conquest, Osbright, then king of England, had one ounce troy of silver divided into twenty pieces, called pence, so that an ounce of silver then was not worth more than 1s. 8d., which continued until the reign of Henry VII., who valued the same at 2s. 6d., and so it remained until the time of Edward IV., who valued the ounce at 3s. 4d. Henry VIII. valued the ounce of silver at 3s. 9d., which continued to Queen Elizabeth's time; she increased the value of the ounce troy to 5s., as it remains to this day.

GENERAL RULE.—All great names are made less by multiplication. All less names are made greater by division. Pounds multiplied by 20 are shillings; shillings by 12 are pence; pence by 2 are halfpence; and halfpence by 2 are farthings. Farthings divided by 2 are halfpence; halfpence by 2 are pence; pence by 12 are shillings; and shillings by 20 are pounds.

EXAMPLES.

1—Reduce £247 to shillings.

20

Ans. 4940s.

2—Reduce 468s. to pence.

12

Ans. 5616d.

3—Reduce 273d. to farthings.

4

Ans. 1092q.

4—Reduce £55 19s. 7d. to pence.

20

1119

12

Ans. 13435d.

5—Reduce £754 17s. 9¾d. to farthings. 20

15097

12

181173

4

Ans. 724695q.

6—In 7656s. how many pounds?

÷2,0) 765,6s.

Ans. £382 16s.

7—In 89594d. how many shillings?

÷12) 89594d.

Ans. 7466s. 2d.

8—In 345600q. how many pounds?
+960) 345600q.
6.
7.
5.
Ans. £360

9—In 960000q. how many pounds?
+960) 960,000q.
...
...
...
Ans. £1000

10—In £478 how many pence?
£478
240
Ans. 114720d.

11—In 114720d. how many pounds?
÷240) 114720d.
72.
89.
11.
Ans. £478

12—In 748800d. how many pounds?
÷240) 748800d.
88.
24.
Ans. £3120

13—In 7376640q how many pounds?
÷960) 7376640q.
664.
508.
683.
Ans. £7684

New Rule for bringing Shillings to Pounds.—First, take the units and tens as so many pounds and shillings; write down the shillings, then multiply the hundreds mentally by 5, adding in the pounds, and you have the pounds and shillings.

EXAMPLE.

In 786543s. how many pounds and shillings?
5,
Ans. £39327 3s.

QUERIES.—What is Reduction? What does Reduction ascending mean? What does Reduction descending signify? How is Reduction proved? How do you bring pounds to farthings? How do you bring farthings to pounds? How do you bring halfpence to pounds? and VICE VERSA.

WEIGHTS AND MEASURES.

TROY WEIGHT.

TROY WEIGHT has its name from Troyes, a town in France, in the province of Champagne, and department of the Aube, and was introduced by William the Conqueror: by it are weighed gold, silver, jewels, and liquors. Its denominations are as follow:—

4 Grains.....make	... ...	1 Carat.*
6 Carats, or 24 Grains	... ...	1 Pennyweight.
20 Pennyweights	... ...	1 Ounce.
12 Ounces...	... ...	1 Pound.
25 Pounds...	... ...	1 Quarter.
100 Pounds...	... ...	1 Hundred Weight.
20 Hundred Weight	... ...	1 Ton of Gold or Silver.

NEW TABLE OF TROY WEIGHT.

OZ.	DWTS.	GRS.	lb.	OZ.	DWTS.	GRS.
12	0	0	1	12	240	5760
0	20	0	$\frac{1}{12}$	1	20	480
0	1	24	$\frac{1}{240}$	$\frac{1}{24}$	1	24
0	0	1	$\frac{1}{5760}$	$\frac{1}{480}$	$\frac{1}{24}$	1
6	0	0	$\frac{1}{2}$	....	....	....
4	0	0	$\frac{1}{3}$	....	....	....
3	0	0	$\frac{1}{4}$	....	....	....
2	8	0	$\frac{1}{6}$	....	....	....
2	0	0	$\frac{1}{6}$	....	....	....
1	10	0	$\frac{1}{8}$	....	....	....
1	0	0	$\frac{1}{12}$	....	....	....
0	10	0	$\frac{1}{24}$	$\frac{1}{2}$	....	....
0	6	16	$\frac{1}{36}$	$\frac{1}{3}$	....	....
0	5	0	$\frac{1}{48}$	$\frac{1}{4}$	....	....
0	4	0	$\frac{1}{60}$	$\frac{1}{5}$	....	....
0	3	8	$\frac{1}{72}$	$\frac{1}{6}$	....	....
0	2	12	$\frac{1}{96}$	$\frac{1}{8}$	....	....
0	2	0	$\frac{1}{120}$	$\frac{1}{10}$	....	....
0	1	16	$\frac{1}{144}$	$\frac{1}{12}$	....	....
0	1	0	$\frac{1}{240}$	$\frac{1}{20}$	1	....
0	0	12	$\frac{1}{480}$	$\frac{1}{40}$	$\frac{1}{2}$	....
0	0	6	$\frac{1}{960}$	$\frac{1}{80}$	$\frac{1}{4}$	....
0	0	4	$\frac{1}{1440}$	$\frac{1}{120}$	$\frac{1}{6}$	....
0	0	3	$\frac{1}{1920}$	$\frac{1}{160}$	$\frac{1}{8}$	....
0	0	2	$\frac{1}{2880}$	$\frac{1}{240}$	$\frac{1}{12}$	....
0	0	1	$\frac{1}{5760}$	$\frac{1}{480}$	$\frac{1}{24}$	....

RULE.—Pounds multiplied by 12 are ounces; ounces by 20 are pennyweights; pennyweights by 24 are grains; and grains by 4 are carats; carats divided by 4 are grains; grains by 24 are pennyweights; pennyweights by 20 are ounces; ounces by 12 are pounds.

* The standard for gold coin is 22 carats, fine gold, and 2 carats copper; for silver 11 oz. 2 dwts., and, 18 dwts. copper.

EXAMPLES.

1.—In 24 lb. troy, how many ounces, pennyweights, and grains?—Ans. 288 oz. 15760 dwts., 138240 grs.
2.—How many pounds troy in 138240 grains?—Ans. 24 lbs.
3.—How many pounds troy are in 85960 grains?—Ans. 14 lb. 11 oz. 1 dwt. 16 grs.
4.—In 14 lb. 11 oz. 1 dwt. 16 grs. how many grains?—Ans. 85960 grs.
5.—In 75 lb. 11 oz. 19 dwts. 23 grs. how many grs.?—Ans. 437759 grs.
6.—In 437759 grains how many pounds troy?—Ans. 75 lb. 11 oz. 19 dwts. 23 grains.
7.—In 16 lb. 0 oz. 14 dwts. 21 grs. how many grains?—Ans. 92517 grs.
8.—In 92517 grains how many pounds troy?—Ans. 16 lb. 0 oz. 14 dwts. 21 grs.
9.—Sold 8 silver teapots, each weighing 3 lb. 9 oz. 18 dwts. 13 grains; how many grains were in all?—Ans. 176360 grs.
10.—In 176360 grains how many pounds?—Ans. 30 lb. 7 oz. 8 dwts. 8 grs.
11.—What quantity of gold will it require to make twelve ornaments, each weighing 1 oz. 18 dwts. 12 grs.?—Ans. 23 oz. 2 dwts.
12.—How many silver tablespoons, each weighing 4 oz. 14 dwts., can be made out of 2 lb. 4 oz. 4 dwts. of silver?—Ans. 6 spoons.

QUERIES.—How do you bring lbs. troy into grains? How do you bring grains into lbs.? How many grains in a lb. troy? What are the goods usually weighed by troy weight?

AVOIRDUPOIS WEIGHT*

Signifies a medium of weight: by it are weighed all goods that are subject to waste, as groceries, tallow, pitch, hemp, flax, wool, and all kinds of metals, except gold and silver.

COMMON WEIGHT.

16 drs.	1 oz.	2 stone or 28 lb.	1 qr.
16 oz.	1 lb.	4 qrs.	1 cwt.
14 lb.	1 stone.	20 cwt.	1 ton.

---

* The corresponding proportion between avoirdupois and troy weight.

1 lb. Avoirdupois weight = 14 oz. 11 dwts. 16 gr. troy = 700 gr.
1 oz. „ „ = 18 dwts. 5½ gr. = 437½ gr.
1 dr. „ „ = 1 dwt. 3½ gr.

1 lb. Troy = 13 oz. 2.65$\frac{1}{7}$ dr.—Avoirdupois = 210.65$\frac{1}{7}$ dr.

1 oz. Troy = 1 oz. 1.55$\frac{3}{7}$ dr.—Avoirdupois = 17.55$\frac{3}{7}$ dr.

A pound Avoirdupois contains 7000 gr. nearly, and a pound Troy 5760 gr.; consequently they are to each other as 17 to 14; or multiply the pounds *Troy by* 144, and divide by 175, and you will have the pounds Avoirdupois.

WOOL WEIGHT.

In some parts of England, 15lb. make a stone; in Ireland, 16lb. to the stone.

England.

15 lb. .. .. .. 1 stone.
2 stones or 30 lb. 1 tod.
8 tods or 240 lb. 1 pack or sack.

Otherwise.

7 lb. .. .. 1 clove.
2 cloves.. .. .. .. 1 stone.
2 stones.. .. .. .. 1 tod.
6½ tods .. .. 1 wey.
2 weys .. .. 1 sack.
12 sacks .. .. 1 last.

NEW TABLE OF AVOIRDUPOIS WEIGHT.

CWTS. QRS. LBS.				TON.	CWTS.	QRS.	STONES.	LBS.	OZ.	DRS.
20	0	0	are	1	20	80	160	2240	35840	573440
10	0	0	..	½	..	..	..	..	..	..
5	0	0	..	¼	..	..	..	..	..	..
4	0	0	..	⅕	..	..	..	..	..	..
2	3	12	..	⅛	..	..	..	..	..	..
2	2	0	..	1/10	..	..	..	..	..	..
2	0	0	..	1/20	..	..	..	..	..	..
1	1	0	..	1/40	..	..	..	..	..	..
0	2	0	..	1/80	..	..	..	..	..	..
0	1	0	is	1/160	..	1	..	..	..	..
1st.	0lb.		are	1/160	1/8	1/2	1	..	..	..
0	8		..	1/320	1/16	1/4	½	8	..	..
0	7		..	1/320	1/16	1/4	½	7	..	..
0	4		..	1/640	1/32	1/8	¼	4	..	..
0	3½		..	1/640	1/32	1/8	¼	3½	..	..
0	1		is	1/2240	1/112	1/28	1/7	1	..	..
	1oz.		..	1/35840	1/1792	1/448	1/112	1/16	1	..
	1dr.		..	1/573440	1/28672	1/7168	1/1792	1/256	1/16	1

CUSTOMARY WEIGHT USED IN BUYING AND SELLING THE FOLLOWING COMMODITIES.

	lbs.		lbs.
A Firkin of Butter is	56	A Barrel of Butter..	224
A Firkin of Soap	64	A Puncheon of Prunes, 10 or 12 cwt.	
A Barrel of Soap	256	A Fother of Lead, 19 cwt. 2 qrs., or	2184
A Barrel of Pot Ashes	200	A Stone of Iron or Shot ..	14
A Barrel of Anchovies	30	A Gallon of Train Oil	10½
A Barrel of Figs, from 96 lbs. to 2¾ cwt.		A Fagot of Steel	120
A Barrel of Candles..	120		

CUSTOMARY WEIGHT OF GOODS (CONTINUED).

	lbs.		lbs.	oz.	dr
A Stone of Glass	5	A Peck Loaf Weighs..	17	6	1
A Quintal of Fish in Newfoundland	100	A Half-Peck	8	11	0
A Seam of Glass 24 stone or	120	A Quartern	4	5	8
A Stone of Cheese	16	A Peck (or Stone) of Flour	14	0	0
A Stone of Meat in London ..	8	A Bushel of Flour ..	56	0	0
A Stone of Meat in the Country	14	A Barrel of Ameriean Flour	196	0	0
A Stone of Hemp	32	A Pack or Load of Flour	240	0	0
A Stone, Horseman's Weight	14	A Sack or five Bushels of Flour*	280	0	0
A Chest of Tea	84				
A Load of Meal, Potatoes ..	240				

SIZES OF BOOKS.

4 pages, or 2 leaves .. 1 sheet ffo.
8 pages, or 4 leaves .. 1 sheet quarto, or 4to.
16 pages, or 8 leaves .. 1 sheet octavo, or 8vo.
24 pages, or 12 leaves .. 1 sheet duodecimo, or 12mo.
36 pages, or 18 leaves .. 1 sheet eighteens, or 18mo.
72 words in Common Law .. 1 sheet.
80 words in Exchequer .. .. 1 sheet.
90 words in Chancery .. .. 1 sheet.

PAPER.

24 sheets .. .. 1 quire.
20 sheets .. .. 1 quire, outside.
25 sheets .. .. 1 printer's quire.
21½ quires, or 516 sheets .. .. 1 printer's ream.
20 quires, or 472 sheets .. .. 1 ream of paper.
2 reams .. .. 1 bundle.
10 reams .. .. 1 bale.
5 dozen parchment .. .. .. 1 roll.

* In some parts of England, a sack of Flour is 18 stones, or 252 pounds.

A COMPENDIOUS METHOD OF REDUCING HUNDREDS, QUARTERS, AND POUNDS, TO POUNDS.

RULE.—Multiply the cwts. by 12, and to the product mentally add the lbs. of the odd weight, which sum is to be so placed under the cwts. that the place of hundreds in this may fall under the units of that: the whole added will give the answer.

EXAMPLES.

13.—123 cwt. 3 qrs. 10 lbs. how many lbs.?

cwt. qrs. lbs. lbs.	Or thus:	cwt. qrs. lbs.	The common method. cwt. qrs. lbs.
123 3 10=94		123 3 10	123 3 10
1570*		123	4
		123	
Ans. 13870 lbs.		12394	495
			28
	Ans.	13870 lbs.	3960
			991
			Ans. 13870 lbs.

14.—In 36 cwt. 1 qr. 13 lbs. how many lbs.?—Ans. 4073 lbs.

15.—In 75 cwt. 3 qrs. 14 lbs. how many lbs.?

cwt. qrs. lbs.
75 3 14
998
Ans. 8498 lbs.

16.—In 273 cwt. 2 qrs. 19 lbs. how many lbs.?—Ans. 30651 lbs.

17.—In 13870 lbs. how many cwts.?

lbs.		
÷112) 13870	÷ 28) 94	10
6 8		
2 4		
Ans. cwt. 123	3 qrs.	10 lbs.

18.—In 264 cwts. 3 qrs. 12 lbs. 11 oz. how many oz.?—Ans. 474635 oz.
19.—In 474635 oz. how many cwts.?—Ans. 264 cwt. 3 qrs. 12 lbs. 11 oz.
20.—In 139 cwt. 1 qr. 22 lbs. 13 oz. how many oz.?—Ans. 249901 oz.
21.—In 249901 oz. how many cwts.?—Ans. 139 cwt. 1 qr. 22 lbs. 13 oz.
22.—In 976 cwt. 3 qrs. 27 lbs. how many lbs.?—Ans. 109423 lbs.
23.—Bought 24 bags of flour, each weighing 2 cwt. 2 qrs. 13 lbs., how many lbs. in all?—Ans. 7032 lbs.
24.—In 3 cwt. 2 qrs. 14 lbs. of sugar, how many parcels are there, each containing half a pound?—Ans. 812 parcels.

QUERIES.—How do you bring lbs. avoirdupois to drachms? How do you bring drachms into pounds weight? How do you bring cwts., qrs., and lbs. to lbs.? How do you bring lbs. to cwts.? Tons, cwts., qrs., and lbs. to lbs., and the reverse?

* The new method, 4 figures, exclusive of the answer; the common method, 14.

To bring Short Weight to Long, and Long Weight to Short.

GENERAL RULE.—From the short weight in cwts., qrs., and lbs., take the $\frac{1}{15}$ of itself, and the remainder is long weight; and to the long weight in cwts., qrs., and lbs., add its $\frac{1}{14}$, and it is short weight of 112 lbs. to the cwt.

Reason.—8 lbs. being the difference—112 lbs. in one case, and 120 in the other. 8 is the 14th of 112, and the 15th of 120; consequently, the 15th taken from the short weight, leaves the long weight of 120 lbs.; and the 14th added to the long weight, makes the short weight of 112 lbs.

EXAMPLES.

25.—In 135 cwt. of 112 lbs., how many cwts. of 120 lbs.?—Ans. 126 cwt.

26.—In 347 cwt. 1 qr. 16 lbs. short weight, how many long weight?—Ans. 324 cwt. 0 qr. 26 $\frac{2}{15}$ lbs.

27.—In 45 cwt. 1 qr. 17 lbs. short weight, how many long?—Ans. 42 cwt. 1 qr. 14 lbs.

28.—In 176 cwt. 3 qrs. 19 lbs. long weight, how many shor weight?—Ans. 189 cwt. 2 qrs. 5 $\frac{5}{14}$ lbs.

QUERY.—How do you bring long weight to short, and the reverse?

CHEMISTS' WEIGHT

Is the same as troy; a chemist's lb. is = to a pound troy, and contains the same number of oz. and grs.; but instead of dwts. the oz. is divided into *scruples* and *drachms:* by it chemists and apothecaries compound their medicines, but buy by avoirdupois. The denominations are—grains, scruples, drachms, ounces, and pounds.

20 grains	1 scruple ℈	8 drachms	1 ounce ℥
3 scruples	1 drachm ʒ	12 ounces	1 pound ℔

RULE *for reducing to the lowest, or bringing to the highest denomination.*

Lbs. × by 12 are ounces.	Grs. ÷ by 20 are scruples.
Oz. × by 8 are drachms.	Scrs. ÷ by 3 are drachms.
Drs. × by 3 are scruples.	Drs. ÷ by 8 are ounces.
Scrs. × by 20 are grains.	Oz. ÷ by 12 are pounds.

NOTE.—The same grain, ounce, and pound, as troy weight, only differently divided aud subdivided.

APOTHECARIES' FLUID MEASURE.

60 minims* ... ... make	1 fluidrachm.	ʒ
8 fluidrachms	1 fluid ounce	℥
16 fluid ounces	1 pint.	0
8 pints	1 gallon.	*cong.*

* The Edinburgh and Dublin Colleges still retain the term GUTTA (drop), instead of MINIM.

ABBREVIATIONS EMPLOYED BY THE FACULTY IN PRESCRIPTIONS, ETC.

℞ (for recipe) take	q. s. (quantum sufficit), a sufficient quantity.
ss. (for semis) the half	cong. (congius), a gallon.
cochl. (cochleare) a spoonful.	

M. (Manipulus), a handful, or M. (for Mice) mix.
P. (Pugillum) as much as can be taken between the two forefingers and the thumb.

The quantities in prescriptions are expressed by small Roman numerals; thus,—

gt. j. (for gutta 1), 1 drop.	ʒ vij. 7 drachms.
♏ ij. two minims or drops.	ʒ iijss. 3½ drachms.
♏ iv. 4 minims.	f ʒ ij. 2 fluidrachms.
♏ xij. 12 minims.	℥ j. 1 ounce.
gr. xxvj. 26 grains.	℥ ss. half ounce.
℈ j. 1 scruple.	℔ ijss. 2½ lbs.
℈ ss. half a scruple.	0. iij. 3 pints.

EXAMPLES.

29.—How many pounds in 4896 scruples?—Ans. 17lbs.
30.—A patient is allowed to take daily 2 drs. 2 scrs. of bark, how long will 7 lbs. last him?—Ans. 252 days.
31.—How many grains are in 231 lbs. 3 oz. 5 grs.?—Ans. 1332005 grs.
32.—In 1332005 grains how many pounds?—Ans. 231 lbs. 3 oz. 5 grs.
33.—In 7 oz. 5 drs. 3 scrs. how many scruples?—Ans. 186 scruples.

LINEAL OR LONG MEASURE.

3	barley-corns, b. c., are	1 inch, in.
4	inches, or 12 b. c.	1 hand, h.
12	inches, or 3 h.	1 foot, ft.
3	feet, or 36 inches	1 yard, yd.
5	feet, or 60 inches	1 pace, p.
2	yards, or 6 ft.	1 fathom, f.
5½	yards, or 16½ ft.	1 roll, poll, or perch.
7	yards, a perch Irish...	
4	poles, or 22 yds.	1 land chain, 1 ch.
40	rods, or 10 ch., or 220 yds.	1 furlong, fur.
8	furlongs, or 80 ch., or 1760 yds.	1 mile, m.
3	miles, or 5280 yds.	1 league, l.
69½	miles, English statute	1 degree, d.
360	degrees the circumference of the globe.	

A nautical mile, 6075,81 feet.
The earth's circumference is equal to 131237500 feet, or 24855 miles, very nearly.

NOTE.—An inch is divided into 8 parts, by joiners, engineers, and mechanics; into 10 parts by surveyors, architects, and others; and 12 parts when used duodecimally. The chain used for measuring land is 66 feet, and it is divided into 100 links, each of them 7.92 inches.

Comparison of Foreign Measures of Length with England.

	Yards		Yards
Mile in England	1760	Small League in Germany ...	5866
" Scotland	1984	" Spain	5028
" Ireland	2200	" Poland	4400
Small League in France ...	2933	" Hungary	8800
" Mean ditto ...	3666	" Ancient Greece	1624
" Large ditto ...	4400	" Sweden and Denmark...	7233
" Italy	1467	" Russia (verst)	1167

THE DISTANCES OF THE COMMERCIAL CITIES IN THE WORLD FROM LONDON, IN GEOGRAPHICAL MILES.

	Dist. from Lond. Miles.		*Dist. from Lond.* Miles.
Algiers	*Africa*.. ... 900	Lisbon	*Portugal* ... 720
Amsterdam ...	*Holland* ... 180	Madrid	*Spain*... ... 660
Antwerp... ...	*Netherlands* . 212	Mecca	*Arabia* ... 1860
Baltimore ...	*United States* 2200	Mexico	*N. America*.. 3240
Berlin	*Prussia* ... 860	Milan	*Italy* 380
Berne	*Switzerland*.. 300	Morocco	*Africa* ... 1200
Boulogne ...	*France*.. ... 101	Munich	*Germany* ... 310
Brussels	*Belgium* ... 209	Naples	*Italy* 660
Bogota	*S. America*.. 3240	New York ...	*United States* 2100
Boston	*United States* 2000	Paris	*France* ... 227
Buenos Ayres ..	*S. America*.. 4620	Pekin	*China* 3480
Cairo	*Egypt*... ... 1320	Philadelphia ...	*United States* 2170
Calais	*France* ... 95	Quebec	*Canada* ... 1920
Calcutta	*East Indies*.. 3060	Rio Janeiro ...	*S. America*.. 4080
Cashmere ...	*Asia* 2220	Rome	*Italy* 600
Constantinople .	*Turkey* ... 900	St. Petersburg.	*Russia* ... 990
Copenhagen ...	*Denmark* ... 480	Samarcand ...	*Tartary* ... 1860
Delhi	*East Indies*.. 2580	Siam	*East Indies*.. 3630
Dieppe	*France* ... 127	Stockholm ...	*Sweden* ... 720
Dresden	*Saxony* ... 360	Stutgard	*Germany* ... 270
Florence	*Italy* 480	Timbuctoo ...	*Africa* ... 2220
Genoa	*Italy* 420	Tonquin	*China*... ... 3540
Hamburgh ...	*Hanseatic City* 320	Tunis	*Africa* ... 900
Hanover	*Germany* ... 300	Turin	*Sardinia* ... 390
Havre	*France* ... 160	Venice	*Italy* 430
Ipsahan	*Persia* ... 1690	Vienna	*Austria* ... 420
Jeddo	*Japan*... ... 4200	Warsaw	*Poland* ... 450
Lima	*S. America*.. 3900	Washington ...	*United States* 2280

RULE.—Miles multiplied by 8 are furlongs; furlongs by 40 are poles; poles by 16½ are feet (English); poles by 21 are feet (Irish); feet by 12 are inches; and inches by 3 are barleycorns.

EXAMPLES.

34.—In 273 English miles how many inches?—Ans. 17297280 inches.
35.—In 17297280 inches how many miles?—Ans. 273 English.
36.—In 273 Irish miles how many inches?—Ans. 22014720 in. Irish.
37.—How many miles in 22014720 inches?—Ans. 273 Irish.
38.—In 45 m. 3 fur. 4 yds. 2 ft. how many feet?—Ans. 304934 ft. Irish.
39.—How many miles in 304934 feet, Irish?—Ans. 45 miles, 3 furlongs, 4 yards, 2 feet.

QUERIES.—How many yards in an English mile? How many in a Scotch mile? How many in an Irish mile? Tell me the yards in a league in France, Germany, Spain, Poland, Hungary, Greece, Sweden, Denmark, and Russia?

CLOTH MEASURE.

Hollands are measured by the ell (English), and tapestry by the ell (Flemish). The weaving of muslin is paid for by the ell (English), but bought and sold by the yard. Linens, woollens, wrought silk, and tape, are sold by the yard.

2¼ inches...make ... ... 1 nail.	3 quarters ... ... 1 Flemish ell.
4 nails... ... ... 1 quarter.	5 quarters ... ... 1 English ell.
4 quarters ... ... 1 yard.	4 qrs. 1 in. ... ... 1 Scotch ell.
6 quarters ... ... 1 French ell.	

Ells (French)	×	by 3, and	÷	by 2 are yards.
Yards —	×	by 2, and	÷	by 3 are ells—French.
Yards —	×	by 4, and	÷	by 3 are ells—Flemish.
Yards —	×	by 4, and	÷	by 5 are ells—English.
Ells (French)	×	by 6, and	÷	by 5 are ells—English.
Ells (English)	×	by 5, and	÷	by 4 are yards.
Ells (Flemish)	×	by 3, and	÷	by 4 are yards.
Ells (French)	×	by 2, are ells—Flemish.		
Ells (English)	×	by 5, and	÷	by 6 are ells—French.
Ells (English)	×	by 5, and	÷	by 3 are ells—Flemish.
Ells (Flemish)	×	by 3, and	÷	by 5 are ells—English.
Ells (Flemish)	×	by 2, are French ells.		

RULE.—Yards multiplied by 4 are quarters; quarters by 4 are nails; yards by 3 are quarters Flemish; yards by 5 are quarters English; yards by 6 are quarters French.

EXAMPLES.

40.—How many nails in 40 yards?—Ans. 640 nails.
41.—In 640 nails how many yards?—Ans. 40 yards.
42.—In 20 yds. 3 qrs. 1 nail how many nails.—Ans. 333 nails.
43.—How many yards are in 333 nails?—Ans. 20 yds. 3 qrs. 1 nail.

44.—How many quarters in 30 yds. 3 qrs.?—Ans. 123 qrs.
45.—How many quarters in 40 ells English?—Ans. 200 qrs.
46.—In 200 quarters how many ells English?—Ans. 40 ells English.
47.—How many yards in 2384 nails?—Ans. 149 yds.

QUERIES.—How are yards brought to ells? How are nails brought to yards? How are ells English brought to ells Flemish? How are ells Flemish brought to ells English? Bring ells English to yards. Ells Flemish to French ells.

YARN MEASURE.

COTTON YARN. WORSTED YARN.

Inches.	Threads.	Skeins, Leas or Raps.	Hanks, or 560 yards.	Spindle.	Inches.	Threads	Leas or Raps.	Hank, or 560 yards.
54	= 1	....	....	....	35	= 1	....	....
4320	80	= 1	....	....	2·860	80	= 1	....
30240	560	7	= 1	....	20·160	560	7	= 1
544320	10080	126	18	= 1	....	....	....	....

LINT OR LINEN YARN.

Inches.	Yards.	Threads	Leas, Cuts, or Raps.	Beers.	Slips.	Hasps.	Spindles	Bundle.
36	= 1	...	...	...	...	...	...	...
90	2½	= 1	...	...	...	...	...	...
10800	300	120	= 1	...	...	...	...	...
21600	600	240	2	= 1	...	...	...	...
108000	3000	1200	10	5	= 1	...	...	...
129600	3600	1440	12	6	1⅕	= 1	...	...
518400	14400	5760	48	24	4⅘	4	= 1	...
2160000	60000	24000	200	100	20	16⅔	4⅙	= 1

NOTE.—Ermland yarn is 85½ in. to one thread, and 40 thd. to one lea; Hamburgh Yarn is 80 in. to one thread, and 90 thd. to one lea. Also, the cotton-reel is 54 in. in circumference; the linen-reel is 90 in.; the worsted-reel is 35 in.; the ounce-thread reel is 30 in.; and a hank of this yarn is 30 thread.

IMPERIAL LIQUID MEASURE.

Established by Act of Parliament, as a General Measure of Capacity for Liquid and Dry Articles.

The Imperial Gallon is the legal standard for regulating all other measures. It must contain 10 lbs. Avoirdupois Weight of pure water, and at the temperature of 62 degrees of Fahrenheit's thermometer. This quantity measures 277¼ cubic inches, very nearly; being about one-fifth greater than the old Wine Measure, one-thirty-second greater than the old Dry Measure, and one-sixtieth less than the old Ale Measure.

IN WINE OR SPIRIT MEASURE.

4 gills*	... make ...	1 pint.	84 gallons ...make .. 1 puncheon.
2 pints	... ...	1 quart.	2 hhds. or 126 gals. 1 pipe or butt.
4 quarts	... ...	1 gallon.	4 hhds. or 252 gals. 1 tun.
63 gallons	... ...	1 hogshead.	

IMPERIAL STANDARD MEASURE.

OLD. gals.		gals.	qts.	pts.	gills.	100th pt.				
10	=	8	1	0	2	·28	...	...	...	1 anker.
18	=	14	3	1	3	·87	...	...	...	1 runlet.
42	=	34	3	1	3	·70	...	...	...	1 tierce.
63	=	52	1	1	3	·45	...	...	...	1 hogshead.
85	=	69	3	1	3	·40	...	...	...	1 puncheon.
126	=	104	3	1	3	·11	...	...	...	1 pipe, or butt.
252	=	209	3	1	2	·22	...	...	...	1 tun.

The imperial gallon contains about one-fifth more than the old gallon.

IN ALE, BEER, AND PORTER MEASURE.

2 pints	... make ...	1 quart.	2 kilderkins, or 36 gals. 1 barrel.
4 quarts	... ...	1 gallon.	3 kilderkins, or 54 gals. 1 hogshead.
9 gallons	... ...	1 firkin.	2 hogsheads, or 108 gals. 1 butt.
2 firkins, or 18 gals.	...	1 kilderkin.	

IMPERIAL STANDARD MEASURE.

OLD. gals.		gals.	qts.	pts.	gills.	100th pt.				
9	=	9	0	1	0	·91	...	...	...	1 firkin.
18	=	18	1	0	1	·82	...	...	...	1 kilderkin.
36	=	36	2	0	3	·64	...	...	...	1 barrel.
54	=	54	3	1	1	·45	...	...	...	1 hogshead.
72	=	72	0	1	3	·27	...	...	...	1 puncheon.
108	=	109	3	0	2	·27	...	...	...	3 butts.

SCOTCH LIQUID MEASURE.

4 gills ... make	...	1 mutchkin.	2 pints ... make ... ... 1 quart.
2 mutchkins	...	1 choppin.	4 quarts ... ... 1 gallon.
2 choppins	...	1 pint.	

The quantity of a hogshead, pipe, puncheon, or tun, varies in different kinds of liquids. Thus—

gals.		gals.	
84	... 1 hhd. of Claret.	93	... 1 hhd. of Marsalas Bronte.
108	... 1 pipe of Sherry.	120	... 1 puncheon of S. Whiskey.
115	... 1 pipe of Port.	110	... 1 puncheon of Brandy.
92	... 1 pipe of Madeira.	60	... 1 hhd. of Brandy.
100	... 1 pipe of Teneriffe	118	... 1 pipe of Cider.
117	... 1 pipe of Lisbon.	90	... 1 puncheon of Rum.
105	... 1 pipe of Malaga.	50	... 1 hhd. of Rum.
30	... 1 hhd. of Hock.	252	... 1 tun of Wine.
92	... 1 hhd. of Cape.	126	... 1 butt or pipe.
52	... 1 hhd. of Tent.		

* The gill is called a quartern in London; in the North, a noggin; and other parts, half a pint.

NEW TABLE OF LIQUID MEASURE.

	TUN.	PIPES.	PUNS.	HHDS.	TIERCE	GAL.	POTL.	QTS.	PTS.
1 tun	1	2	3	4	6	252	504	1008	2016
1 pipe	$\frac{1}{2}$	1	..	..	..	..	..	..	..
1 pun	$\frac{2}{3}$	$\frac{2}{3}$	1	..	..	..	..	..	..
1 hhd.	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$	1	..	..	..	..	..
1 tierce	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{2}{3}$	1	..	..	..	..
36 gals	$\frac{1}{7}$	$\frac{2}{7}$	$\frac{3}{7}$	$\frac{4}{7}$	$\frac{6}{7}$	..	..	..	..
28 „	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{1}{3}$	$\frac{4}{9}$	$\frac{2}{3}$	..	..	..	..
21 „	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{1}{2}$	..	..	..	..
18 „	$\frac{1}{14}$	$\frac{1}{7}$	$\frac{3}{14}$	$\frac{2}{7}$	$\frac{3}{7}$	..	..	..	..
14 „	$\frac{1}{18}$	$\frac{1}{9}$	$\frac{1}{6}$	$\frac{2}{9}$	$\frac{1}{3}$	..	..	..	..
12 „	$\frac{1}{21}$	$\frac{1}{24}$	$\frac{1}{7}$	$\frac{4}{21}$	$\frac{2}{7}$	..	..	..	..
9 „	$\frac{1}{28}$	$\frac{1}{14}$	$\frac{3}{28}$	$\frac{1}{7}$	$\frac{3}{14}$	..	..	..	..
7 „	$\frac{1}{36}$	$\frac{1}{18}$	$\frac{1}{12}$	$\frac{1}{9}$	$\frac{1}{6}$	..	..	..	..
6 „	$\frac{1}{42}$	$\frac{1}{21}$	$\frac{1}{14}$	$\frac{2}{21}$	$\frac{1}{7}$	..	..	..	..
4 „	$\frac{1}{63}$	$\frac{2}{63}$	$\frac{1}{21}$	$\frac{4}{63}$	$\frac{2}{21}$	..	..	..	..
3 „	$\frac{1}{84}$	$\frac{1}{42}$	$\frac{1}{28}$	$\frac{1}{21}$	$\frac{1}{14}$	..	..	..	.
2 „	$\frac{1}{126}$	$\frac{1}{63}$	$\frac{1}{42}$	$\frac{2}{63}$	$\frac{1}{21}$	..	..	..	..
4 „	$\frac{1}{252}$	$\frac{1}{126}$	$\frac{1}{84}$	$\frac{1}{63}$	$\frac{1}{42}$	..	..	..	..
1 pottle	$\frac{1}{504}$	$\frac{1}{252}$	$\frac{1}{168}$	$\frac{1}{126}$	$\frac{1}{84}$	$\frac{1}{2}$	..	..	..
1 quart	$\frac{1}{1008}$	$\frac{1}{504}$	$\frac{1}{336}$	$\frac{1}{252}$	$\frac{1}{168}$	$\frac{1}{4}$	$\frac{1}{2}$	..	..
1 pint	$\frac{1}{2016}$	$\frac{1}{1008}$	$\frac{1}{672}$	$\frac{1}{504}$	$\frac{1}{336}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	..
$\frac{1}{2}$ pint	$\frac{1}{4032}$	$\frac{1}{2016}$	$\frac{1}{1344}$	$\frac{1}{1008}$	$\frac{1}{672}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{3}$
1 nog.	$\frac{1}{8064}$	$\frac{1}{4032}$	$\frac{1}{2688}$	$\frac{1}{2016}$	$\frac{1}{1344}$	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$

RULE.—Tuns multiplied by 4 are hogsheads; hogsheads × by 63 are gallons; gallons × by 4 are quarts; quarts × by 2 are pints; pints divided by 2 are quarts; quarts ÷ by 4 are gallons; gallons ÷ by 63 are hogsheads; hogsheads ÷ by 4 are tuns.

EXAMPLES.

48.—How many pints are there in 3 hhds. 20 gals. 1 qt.?—Ans. 1674 pts.
49.—In 1674 pints how many hogsheads?—Ans. 3 hhds. 20 gals. 1 qt.
50.—In 63 hhds. how many pints?—31752 pints.
51.—Reduce 24 gallons 3 quarts to gills?—Ans. 1792 gills.
52.—In 20 tuns 3 hhds. 50 gallons how many gallons?—Ans. 5279 gals.
53.—In 21 gallons 2 quarts 1 pint how many pints?—Ans. 173 pints.

QUERY.—How are tuns brought to hogsheads; to gallons; to pints? How are pints brought to quarts; to gallons; to hogsheads; to tuns?

DRY MEASURE.

2 pints	make	1 quart.	8 bushels ... make ... 1 quarter.
4 quarts		1 gallon.	4 quarters ... ... 1 chaldron.
2 gallons		1 peck.	10 quarters ... ... 1 last.
4 pecks		1 bushel	

The old dry gallon contained 268 four-fifths cubic inches.
Coals are now sold by weight only.

EXAMPLES.

54.—In 24 gals. 2 qts. 1 pt. how many pints?—Ans. 197 pints.
55.—In 4687 pints how many gallons?—Ans. 585 gals. 3 qts. 1 pt.
56.—How many quarts in 1352 quarters, 5 bushels, 3 pecks, 1 gallon, 3 quarts?—Ans. 346303 quarts.
57.—In 30720 quarts of corn how many quarters?—Ans. 120 qrs.

FRENCH WEIGHTS AND MEASURES.

THE following tables give an example of the decimal system of weights and measures used in France; each increasing and diminishing in a tenfold proportion:—

LONG MEASURE.

			LENGTH IN ENGLISH.			
			Miles.	Yards.	Feet.	Inches.
10 Millimètres	are 1	Centimètre	...	...	...	0·39
10 Centimètres	1	Decimètre	...	...	...	3·93
10 Decimètres	1	Mètre	...	1	0	3·93
10 Mètres	1	Decamètre	...	10	2	9·7
10 Decamètres	1	Hectomètre	...	109	1	1·07
10 Hectomètres	1	Kilomètre	...	993	1	10·3
10 Kilomètres	1	Myriamètre	1	376	0	9·17

The Mètre is the unit of length, and is the ten millionth part of a line supposed to be drawn from the pole of the earth to the equator.

SQUARE MEASURE.

			SUPERFICES IN ENGLISH.			
			Acres.	Roods.	Perches.	Yards.
10 Milliares	are 1	Centair	...	...	...	1·19
10 Centaires	1	Deciare	...	...	...	11·96
10 Deciares	1	Are	...	...	3	28·85
10 Ares	1	Deca-are	...	...	39	16·28
10 Deca-ares	1	Hectare	2	1	35	11·58
10 Hectares	1	Kilare	24	2	33	25·07

The Are is the unit of square measure, and is equal to the square of one Decamètre. It is nearly the 40th part of an English acre.

LIQUID MEASURE.

			ENGLISH MEASURE. Gallons.	Pints.
10 Millilitres are	1	Centilitre	... ...	0·0176
10 Centilitres	1	Decilitre	... ...	0·176
10 Decilitres	1	Litre...	... ...	1·76
10 Litres	1	Decalitre	2	1·607
10 Decalitres	1	Hectolitre...	22	0·077
10 Hectolitres	1	Kilolitre	220	0·774
10 Kilolitres	1	Myrialitre...	2200	7·774

The Litre is the unit of capacity, or of the content of any vessel for holding liquids, &c. It is the cube of one decimètre. The standard unit of solids and aeriform fluids is the stere or mètre cube, equal to 35·316 English cube feet.

WEIGHT.

			ENGLISH WEIGHT. Oz. Avdp.	Oz. Troy.
10 Milligrammes are	1	Centigramme	·00035 ...	·00032
10 Centigrammes	1	Decigramme	·00352 ...	·00321
10 Decigrammes	1	Gramme	·03529 ...	·03217
10 Grammes	1	Decagramme	·35296 ...	·32171
10 Decagrammes	1	Hectogramme	3·52969 ...	3·21717
10 Hectogrammes	1	Kilogramme	35·29696 ...	32·17171

GEOMETRICAL MEASURE.

60 seconds″ ... make ... 1 minute.′ | 90 degrees ... make ... 1 quadrant.
60 minutes ... ... 1 degree.° | 360 degs., or 4 quadrants 1 circle.

In mathematical sciences, the calculations are founded on the division of the circle.

A degree of latitude or longitude on the equator, measures 69·07, or $69\frac{7}{10}$ British miles.

A nautical mile is one-sixtieth part, or a minute of a degree; six geographical miles are nearly equal to seven English miles.

The great circle of the Ecliptic or Zodiac, is divided in twelve signs, each containing thirty degrees.

THE SIX NORTHERN SIGNS.

SPRING SIGNS.		SUMMER SIGNS.	
The Sun enters,—		*The Sun enters,—*	
♈	*Aries*, the Ram, March 21.	♋	*Cancer*, the Crab, June 21.
♉	*Taurus*, the Bull, April 18.	♌	*Leo*, the Lion, July 23.
♊	*Gemini*, the Twins May 21.	♍	*Virgo*, the Virgin, August 23.

THE SIX SOUTHERN SIGNS.

AUTUMNAL SIGNS.		WINTER SIGNS.	
The Sun enters,—		*The Sun enters,*	
♎	*Libra*, the Balance, Sept. 23.	♑	*Capricornus*, the Goat, Dec. 21.
♏	*Scorpio*, the Scorpion, Oct. 23.	♒	*Aquarius*, Water-bearer, Jan. 19.
♐	*Sagittarius*, the Archer, Nov. 21.	♓	*Pisces*, the Fishes, Feb. 18.

"The ram, the bull, the heavenly twins,
And next the crab the lion shines;
The virgin and the scales,
The scorpion, archer, and sea-goat,
The man that holds the water-pot,
And fish with glittering tails."

The progress of the sun through these signs causes the variation in the length of days, and the consequent vicissitudes of the seasons. Spring commences at the Vernal Equinox (March 21), when the sun enters Aries; Summer, at the Summer Solstice (June 21), when he enters Cancer; Autumn, at the Autumnal Equinox (September 23), when he enters Libra; and Winter, at the Winter Solstice (December 21), when he enters Capricorn.

The longest day is that of the Summer Solstice, and the shortest that of the Winter Solstice. At the Equinoxes, the day and night are everywhere equal.

☉ *Sol*, the Sun, the centre of the solar system.

☽ *Luna*, the Moon, a secondary planet, attending the earth.

WANDERING STARS, CALLED PLANETS.

☿ Mercury. ♀ Venus. ⊕ The Earth. ♂ Mars.
♃ Jupiter. ♄ Saturn. ♅ Herschel.

TIME MEASURE.

60 seconds *(sec.)*	1 minute, *min.*
60 minutes, or 3600 seconds	1 hour, *hr.*
24 hours, or 1440 minutes	1 day, *d.*
7 days, or 168 hours	1 week, *wk.*
4 weeks, or 28 days	1 lunar month, *m.*
28, 29, 30, or 31 days	1 calendar month.
52 wks., 1 day, 6 hrs.; or 365 days 6 hrs.; or 8766 hrs.	1 Julian year, *yr.*
365 days, 5 hours, 48 minutes, 51½ seconds	1 solar year.
12 calendar months, or 13 lunar	1 year.
100 years	1 century.

QUARTERLY TERMS.

In England.	*In Scotland.*
Lady Day, March 25th.	Candlemas, February 2nd.
Midsummer, June 24th.	Whitsuntide, May 15th.
Michaelmas, September 29th.	Lammas, August 1st.
Christmas, December 25th.	Martinmas, November 11th.

To know the days in each month, observe—

The days are thirty in September,
April, June, and November;
Twenty-eight in February alone;
In each other thirty-one;
But in every leap-year* you'll find
February counts twenty-nine.

EXAMPLES.

58.—In 72015 hours, how many weeks?—Ans. 428 weeks, 4 days, 15 hours.

59.—How many hours are there in 428 weeks, 4 days, 15 hours?—Ans. 72015 hours.

60.—A clock strikes 156 times a day; how many strokes in 6 years?—Ans. 341640.

61.—How many minutes has a boy lived who is 10 years and 6 weeks old? Ans. 5316480 minutes.

62.—How many years and days is it since the battle of Waterloo, which was gained on the 18th of June, 1815, it being now the 1st of May, 1854?—Ans. 38 years, 196 days.

63.—In 365 days how many minutes?—Ans. 525600 minutes.

64.—In 16 yrs. 5 mon. 2 weeks, how many seconds?—516499200 seconds.

65.—Bring 72468573 minutes to years?—Ans. 37 years, 320 days, 9 hours, 33 minutes.

QUERIES.—How many minutes in an hour? How many hours in a day? How many days in a week? How many weeks in a year? How would you bring years to minutes, and days to years?

* The leap-year is found by dividing by 4: if even, it is leap-year; if odd, so many after leap-year.

STANDARD WEIGHTS OF THE PRESENT COINS.

	dwt.	grs.
Sovereign	5	$3\frac{3}{11}$
Half ditto	2	13
Crown	18	$4\frac{4}{11}$
Half ditto	9	$2\frac{8}{11}$
Shilling	3	$15\frac{8}{11}$

	dwt.	grs.
Sixpence	1	$19\frac{7}{11}$
Fourpence	1	$5\frac{1}{11}$

Copper 24 pence to the pound avoirdupois.

NOTE.—The mint price of gold is £3 17s. 0½d. per ounce, or £46 14s. 6d. per lb. Silver is worth 5s. an ounce. 1 lb. of silver is coined into 66s. Any sum in silver over 40s. is not a legal tender; nor is any sum in copper over 12d. a legal payment. Gold coin wastes about a half per cent. in 16 years' wear, and silver from 2 to 5 per cent. All alloyed gold is supposed to be divided into 24 equal parts. Standard gold for coin consists of 22 carats of pure gold, and 2 parts of pure copper alloy. Standard silver contains 11 oz. 2 dwts. of pure silver, and 18 dwts. of alloy. The new standard for watch cases, is 18 carats fine.

NEW TABLE OF MONEY.

	of £1.	of 10s.	of 6s.8d.	of 5s.	of 3s.4d.	of 2s.6d.	of 2s.	of 1s.8d.	of 1s.	of 10d.
10s. 0d.	½	..	..	..	..	..	..	..	..	..
6 8	⅓	..	..	..	..	..	..	..	..	..
5 0	¼	½	..	..	..	..	..	..	..	..
3 4	⅙	⅓	½	..	..	..	..	..	..	..
2 6	⅛	¼	..	½	..	..	..	..	..	..
2 0	$\frac{1}{10}$	⅕	..	..	..	..	..	..	..	..
1 8	$\frac{1}{12}$	⅙	¼	⅓	½	..	..	..	..	..
1 4	$\frac{1}{15}$	..	⅕	..	..	..	..	..	..	..
1 3	$\frac{1}{16}$	⅛	..	¼	..	½	..	..	..	..
1 0	$\frac{1}{20}$	$\frac{1}{10}$	..	⅕	..	..	½	..	..	..
0 10	$\frac{1}{24}$	$\frac{1}{12}$	⅛	$\frac{1}{10}$	¼	⅓	..	½	..	..
0 8	$\frac{1}{30}$	$\frac{1}{15}$	$\frac{1}{10}$	..	$\frac{1}{10}$	..	⅓	..	..	..
0 7½	$\frac{1}{32}$	$\frac{1}{16}$	..	⅛	..	¼	..	..	..	..
0 6	$\frac{1}{40}$	$\frac{1}{20}$	..	$\frac{1}{10}$	..	⅛	¼	..	½	..
0 5	$\frac{1}{48}$	$\frac{1}{24}$	$\frac{1}{16}$	$\frac{1}{12}$	⅛	⅙	..	¼	..	½
0 4	$\frac{1}{60}$	$\frac{1}{30}$	$\frac{1}{20}$	$\frac{1}{15}$	$\frac{1}{10}$	..	⅙	⅕	⅛	..
0 3	$\frac{1}{80}$	$\frac{1}{40}$	..	$\frac{1}{20}$	..	$\frac{1}{10}$	⅛	..	¼	..
0 2	$\frac{1}{120}$	$\frac{1}{60}$	$\frac{1}{40}$	$\frac{1}{30}$	$\frac{1}{20}$	$\frac{1}{15}$	$\frac{1}{12}$	$\frac{1}{10}$	$\frac{1}{6}$	⅙
0 1	$\frac{1}{240}$	$\frac{1}{120}$	$\frac{1}{80}$	$\frac{1}{60}$	$\frac{1}{40}$	$\frac{1}{30}$	$\frac{1}{24}$	$\frac{1}{20}$	$\frac{1}{12}$	$\frac{1}{10}$
0 0½	$\frac{1}{480}$	$\frac{1}{240}$	$\frac{1}{160}$	$\frac{1}{120}$	$\frac{1}{80}$	$\frac{1}{60}$	$\frac{1}{48}$	$\frac{1}{40}$	$\frac{1}{24}$	$\frac{1}{20}$
0 0¼	$\frac{1}{960}$	$\frac{1}{480}$	$\frac{1}{320}$	$\frac{1}{240}$	$\frac{1}{160}$	$\frac{1}{120}$	$\frac{1}{96}$	$\frac{1}{80}$	$\frac{1}{48}$	$\frac{1}{40}$

ADDITION OF MONEY.

Rule.—For 4 in farthings carry 1 to the pence; for 12 in pence 1 to the shillings; for 20 in shillings 1 to the pounds; and 1 for every 10 in the pounds, as in simple addition.

Reason.—Four farthings make 1d. in the place of pence; 12 pence 1s. in the line of shillings; and every 20s. £1 in the column of shillings; which add to the pounds as whole numbers.

EXAMPLES.

1.—£	s.	d.	2.—£	s.	d.
7168	17	4¾	1313	16	5¾
3133	14	11¼	1927	11	10¼
3171	19	10¾	3168	16	5¾
Ans. £14954	6	9¼	Ans. £10178	16	6
13474	12	2¾	6410	4	9¼
Proof. 14954	6	9¼	Proof. 10178	16	6

3.—£	s.	d.	4.—£	s.	d.	5.—£	s.	d.
57	16	3¾	97	18	3¾	56	16	9¾
42	13	9¾	84	16	9¼	47	13	3¾
33	17	6¼	73	17	5¾	83	13	9¼
53	18	8¾	64	13	5¾	62	17	5¾
76	16	10¾	53	18	6¾	48	13	9¾
84	17	6¼	63	19	7¾	65	15	10¼
Ans. £			Ans. £			Ans. £		

In page 28 we introduced a new system of simple addition for practice on the blackboard, (in order to save trouble to teachers in large schools), by which they can see at one view the answer of any question without the trouble of adding the sum over again. On the same principle, we here lay down a new system of compound addition, which may be made applicable in all cases, no matter what the denomination.

Rule.—Put the first line down at pleasure, but have the second line to correspond with the first, so that in the pence, the two figures in units' place make 12. In the line of shillings, the next two figures to make 20, with the carried figures from the pence, and in the line of pounds, that each two figures make 10. The key line may be set down at top, bottom, or in the middle of the question, which will be the answer required.

6.—£	s.	d.		7.—£	s.	d.		8.—£.	s.	d.	
6	7	9		13	11	11	K.L.	24	7	6	
3	12	3		8	7	6		75	12	6	
7	6	5		1	12	6		53	18	9	
2	13	7		3	13	7		46	1	3	
6	9	8		6	6	5		34	17	6	K. L.
3	10	4		9	12	10		56	16	4	
5	9	2	K.L.	0	7	2		43	3	8	
Ans. £35	9	2		Ans. £43	11	11		Ans. £334	17	6	

APPLICATION.

9.—I owe Messrs. Potter & Norris, merchants, Manchester, as follows, viz.:—For calico, £13 10s.; silk, £17 13s. 5d.; cotton, £208 17s.; chintz, £86 0s. 9d.; a former account £300; selicia, £15 18s. 3½d.; broad cloth, £30 10s. 4½d.; what do I owe them in all?—Ans. £672 8s. 10½d.

10.—Bought of Messrs. Bannerman & Sons, York-street, Manchester, goods to the amount of £1468 16s. 7d.; paid freight, £27 7s. 6d.; other charges, £23 14s. 7½d.; I sold them immediately for £1668 17s. 6½d.; what sum did I gain?—Ans. £148 18s. 10d.

11.—Bought of Messrs. Henry and Co., Portland-street, Manchester, 20 pieces of black silk @ £3 1s. 9d. per piece; 30 dozen silk handkerchiefs @ £1 16s. 3d. per dozen; 24 pieces of Indian chintz @ £2 8s. 5d. per piece; 28 pieces of prints @ £1 9s. 7d. per piece; and 60 pieces of fine muslin @ £1 5s. 6d. per piece; paid cash £209 10s. 11d.; what remains due?—Ans. £82 11s. 11d.

TROY WEIGHT.

RULE.—For 24 grains, carry 1 to the pennyweights; for 20 pennyweights, 1 to the ounces; for 12 ounces, 1 to the lbs.; and 1 for every 10 in the lbs. carry 1 as in simple addition.

EXAMPLES.

	lbs.	oz.	dwts.	gr.
12.—	4712	11	19	17
	3714	10	17	15
	9714	11	13	17
	3174	10	17	12
Ans.				

	lbs.	oz.	dwts.	gr.
13.—	163	10	15	13
	971	11	14	16
	316	10	13	17
	941	10	11	13
Ans.				

	lbs.	oz.	dwts.	gr.
14.—	4763	9	13	17
	5236	11	19	6
	4273	7	13	13
	3412	5	12	14
Ans.				

APPLICATION.

15.—Bought of Messrs. Hunt and Roskell, gold and silversmiths, Exchange Buildings, Manchester, 3 dozen of silver spoons, weighing 5 lbs. 9 oz. 8 dwts.; a teapot, weighing 3 lbs. 2 oz. 16 dwts. 16 grains; two salvers, weighing 4 lbs. 6 oz. 17 dwts.; a dozen silver forks, weighing 1 lb. 8 oz. 19 dwts. 22 grs.; what was the weight of all these articles?—Ans. 15 lbs. 4 oz. 1 dwt. 14 grs.

16.—Milner Gibson, Esq., M.P., has a service of plate in which there are 20 dishes, weighing 203 oz. 8 dwts.; 36 plates, weighing 408 oz. 9 dwts.; 5 dozen spoons, weighing 112 oz. 8 dwts.; 12 salts, weighing 71 oz. 7 dwts.; knives and forks, weighing 78 oz. 5 dwts.; two large cups and a tankard, weighing 121 oz. 7 dwts.; with sundry articles, weighing 105 oz. 5 dwts.; what was the weight of the whole?—Ans. 91 lbs. 3 oz. 9 dwts.

QUERIES.—How do you bring grains to lbs.? lbs. to grains? How do you prove Compound Addition?

AVOIRDUPOIS WEIGHT.

RULE.—For 16 drachms carry 1 to the ounces; for 16 ounces, 1 to the lbs.; for 28 lbs., 1 to the quarters; for 4 quarters, 1 to the cwts.; for 20 cwts., 1 to the tons; and the tons as in simple addition.

EXAMPLES.

	tons.	cwt.	qr.	lb.
17.—	4746	17	3	14
	1373	14	1	17
	1468	13	3	15
	1313	11	1	19
Ans.				

	cwt.	qr.	lb.
18.—	134	3	17
	131	2	18
	147	1	17
	914	2	17
Ans.			

	lb.	oz.	dr.
19.—	1376	11	15
	1314	10	11
	3715	11	14
	1123	10	14
Ans.			

APPLICATION.

20.—Bought 5 bags of hops: the first weighed 4 cwts. 3 qrs. 13 lbs.; the second, 2 cwts. 2 qrs. 11 lbs.; the third, 2 cwts. 3 qrs. 5 lbs.; the fourth, 2 cwts. 3 qrs. 12 lbs.; the fifth, 2 cwts. 3 qrs. 15 lbs.; what was the weight of the whole?—Ans. 16 cwts.

21.—Bought of Binyon & Co., grocers and tea merchants, St. Ann's Square, Manchester, 6 hhds. of sugar: the first weighed 5 cwts. 3 qrs. 27 lbs.; the second, 4 cwts. 1 qr. 19 lbs.; the third, 6 cwts. 2 qrs. 20 lbs.; the fourth, 3 cwts. 3 qrs. 22 lbs.; the fifth, 7 cwts. 1 qr. 11 lbs.; and the sixth, 4 cwts. 3 qrs. 17 lbs.; what was the weight of all?—Ans. 33 cwts. 1 qr. 4 lbs.

CHEMISTS' WEIGHTS.

RULE.—For 3 in scruples, carry 1 to the drachms; for 8 in drachms, 1 to the ounces; for 12 in ounces, 1 to the lbs.; and the lbs. as in simple addition.

EXAMPLES.

	lb.	oz.	dr.	sc.
22.—	174	10	7	1
	19	11	5	1
	11	10	6	2
	9	6	1	1
	4	5	4	1
	14	1	3	2
Ans.				

	lb.	oz.	dr.	sc.
23.—	11	11	5	1
	12	11	4	2
	17	10	5	1
	13	11	6	2
	17	10	5	1
	12	11	4	1
Ans.				

	lb.	oz.	dr.	sc.
24.—	19	11	4	1
	14	10	5	2
	14	11	2	1
	14	10	7	1
	17	8	5	2
	18	4	4	1
Ans.				

APPLICATION.

25.—Mr. Westmacott, chemist, Manchester, mixed 5 ingredients; the first weighed 13 lbs. 7 oz.; the second, 11 oz. 7 drs. 1 scr.; the third, 7 lbs. 0 drs. 2 scrs.; the fourth, 11 lbs. 3 drs. 1 scr.; the fifth, 15 lbs. 5oz. 2 scrs.; what was the weight in all?—Ans. 48 lbs. 0 oz. 4 drs.

QUERIES.—What do you carry from the grains, scruples, drachms, and ounces?

LIQUID MEASURE.

RULE.—For 4 gills carry 1 to the pints; for 2 pints, 1 to the quarts; for 4 quarts, 1 to the gallons; for 63 gallons, 1 to the hogsheads; for 4 hogsheads, 1 to the tuns; and the tuns as in simple addition.

EXAMPLES.

26.					27.						28.					
hhd.	gal.	qt.	pt.	g.	tun.	hhd.	gal.	qt.	pt.	g.	tun.	hhd.	gal.	qt.	pt.	g.
31	57	2	1	1	37	3	27	2	1	1	39	2	14	1	1	3
19	17	3	1	3	17	2	60	1	1	3	40	1	57	3	1	2
17	39	2	1	1	39	1	59	1	1	1	99	2	55	2	1	3
Ans.					Ans.						Ans.					

APPLICATION.

29.—Bought of Findlater and Mackie, Ducie Street, Manchester, 3 casks of Irish Whiskey: the first contained 44 gals. 3 qts. 1 pt. 3 gills; the second, 37 gals. 2 qts. 3 gills; and the third, 61 gals. 3 qts. 1 pt. 2 gills; what did the whole contain?—Ans. 144 gals. 2 qts.

NOTE.—One gallon of water weighs 10 lbs. avoirdupois; a pint, 1¼ lb.; and a bushel, 80 lbs. The spirit merchant will find at the end of this work, tables constructed, by which he can measure with the common inch rule, casks from 10 to 130 gallons, whether the cask be lying on its side or standing upright. To reduce inches to gallons, multiply by 1000, and divide by 277·274; reverse the operation to bring gallons to inches.

Repeat the Rule for Liquid Measure.

DRY MEASURE.

RULE.—For 2 pints carry 1 to the quarts; for 4 quarts, 1 to the gallons; for 2 gallons, 1 to the pecks; for 4 pecks, 1 to the bushels; and for 8 bushels, 1 to the quarters; and the quarters as in simple addition.

	qrs.	b.	p.	g.		b.	p.	g.	q.	p.		b.	p.	g.	q.	p.
30.—	37	1	3	3	31.—	37	3	1	1	1	32.—	31	2	1	1	0
	60	1	1	2		26	2	0	0	0		17	1	1	1	0
	14	0	2	3		23	3	1	0	1		20	1	1	1	0
Ans.					Ans.						Ans.					

APPLICATION.

33.—Messrs. Losh, Wilson, and Bell, merchants, Newcastle-on-Tyne, consigned to their correspondent at Hamburgh, on the 2nd of January, 1857, 27 qrs. 6 bs. 3 p. of wheat; on the 10th, 38 qrs. 4 bs. 2 p.; on the 14th, 49 qrs. 6 bs.; and on the 20th of the same month, 58 qrs. 7 bs. 3 p.; how much did they export during the month?—Ans. 175 qrs. 1 bs.

Repeat the rule for Dry Measure.

CLOTH MEASURE.

RULE.—For every 4 nails, carry 1 to the quarters; for every 4 quarters, 1 to the yards; for every 5 quarters, 1 to the ells English; and for every 6 quarters, 1 to the ells French.

EXAMPLES.

	yds.	qr.	ns.		yds.	qr.	ns.		e.E.	qr.	ns.		e.E.	qr.	ns.
34.—	36	3	1	35.—	374	1	2	36.—	421	2	2	37.—	312	2	2
	37	1	1		387	2	3		123	1	3		123	2	6
	14	1	2		462	3	1		210	2	3		314	1	2
Ans.				Ans.				Ans.				Ans.			

APPLICATION.

38.—Bought of Messrs. Kendal, Milne, and Faulkner, silk merchants, Manchester, seven pieces of silk: the first contained 72 yds. 1 qr. 2 ns.; the second 20 yds. 3 ns.; the third, 100 yards; the fourth, 36 yds. 3 ns.; the fifth, 46 yds. 2 ns.; the sixth, 71 yds. 2 qrs. 1 n.; and the seventh, 46 yds. 1 qr. 2 n.; how many yards were there in all?—Ans. 392 yds. 3 qrs. 1 n.

Repeat the rule for Cloth Measure.

LONG MEASURE.

RULE.—For 3 barleycorns, carry 1 to the inches; for 12 inches, 1 to the feet; for 3 feet, 1 to the yards; for 5½ yards, 1 to the poles English; for 7 yards, 1 to the perches Irish; for 40 poles, carry 1 to the furlongs; for 8 furlongs, 1 to the miles.

EXAMPLES.

	ml.	fur.	per.		ml.	fur.	per.		ml.	fur.	per.		ml.	fur.	yd.
39.—	27	5	38	40.—	176	1	6	41.—	4	6	20	42.—	177	7	6
	19	6	33		178	2	8		9	5	13		197	6	5
	14	7	19		197	2	10		7	4	9		189	5	6
Ans.				Ans.				Ans.				Ans.			

APPLICATION.

43.—James rode 35 mls. 2 fur. 34 per. on Monday; Joseph walked 24 mls. 6 fur. 25 per. 2 yds. on Tuesday; he rode, on Wednesday, 42 mls. 7 fur. 4 yds.; he walked, on Thursday, 15 mls. 4 fur. 38 per. 3 yds.; what distance did they travel in the four days?—Ans. 118 mls. 5 fur. 18 per. $1\frac{7}{11}$yds.

Repeat the rule for Long Measure

CUBIC, OR SOLID MEASURE.

TABLE.

1728 inches 1 sold foot. 27 feet 1 solid yard.	166⅔ cubic yards 1 perch.

RULE.—For every 1728 cubic inches, carry 1 to the feet; for every 27 cubic feet, 1 to the yards; and for every 166⅔ cubic yards, 1 to the perches; and perches as in simple addition.

EXAMPLES.

1.				2.				3.			
per.	yds.	ft.	in.	per.	yds.	ft.	in.	per.	yds.	ft.	in.
374	130	14	150	176	126	23	1711	312	19	17	13
371	176	24	140	314	141	17	1214	164	26	23	14
914	68	28	13	431	19	27	1711	726	17	11	18
Ans.				Ans.				Ans.			

Repeat the rule for Solid Measure.

SQUARE OR LAND MEASURE.

TABLE.

144 square inches make 1 square ft.
9 square feet make 1 square yard.
30¼ sq. yds. make 1 pole or perch.
16 poles make 1 pole or chain.
10 chains make 1 acre.

In Ireland.

9 square feet make 1 square yard.
49 square yards make 1 sq. perch.
40 perches make 1 rood.
4 roods make 1 acre.

RULE.—For every 144 square inches, carry 1 to the square feet; for every 9 square feet, 1 to the square yards; for every 49 square yards, 1 to the square perches or poles; for every 40 square perches or poles, 1 to the square acres;* and the acres as in simple addition.

NOTE.—The statute pole is 5½ yards, but varies in different localities. In Lancashire, 7 yards make a pole or perch; in Cheshire, 8 yards; and in Ireland the same as Lancashire.

EXAMPLES.

	a.	r.	p.	yds.	ft.	in.
1.—	147	1	27	23	7	78
	192	2	16	38	4	101
	141	3	39	16	6	140
Ans.						

	a.	r.	p.	yds.	ft.	in.
2.—	2376	3	16	12	2	140
	1242	3	32	17	7	111
	1723	2	18	32	k	78
Ans.						

Repeat the rule for Land or Square Measure.

TIME.

RULE.—For 60 seconds carry 1 to the minutes; for 60 minutes, 1 to the hours; for 24 hours, 1 to the days; for 7 days, 1 to the weeks; for 4 weeks 1 to the months; for 12 months 1 to the years; and add the years as in simple addition.

* An English acre is 4840 yards; a Scotch acre 6184 yards; an Irish acre 7840 yards. The French acre (arpent) is 54,450 English feet. The English is to the Scotch acre as 78 is to 100. The Welsh acre is equal to two English acres. The Irish acre is to the English as 11 is to 14, or 2r. 10½ per. more.

EXAMPLES.

	w.	d.	h.	m.	s.
1.—27	4	18	37	56
37	6	19	15	51
31	4	18	51	40

Ans.

	degs.	′	″	‴	⁗
2.—176	30	50	41	25
195	25	47	46	21
197	5	43	51	27

Ans.

Repeat the rule for Time.

COMPOUND SUBTRACTION

Teaches to find the difference between two numbers of different denominations.

RULE.—Place the lesser number under the greater. If the lower farthings be greater, borrow from 4, and carry 1 to the pence;* when the lower pence are higher, borrow from 12, and carry 1 to the shillings; when the lower shillings are higher, borrow from 20, carry 1 to the pounds, and the pounds as in simple subtraction. The method of proof is the same as in simple subtraction.

EXAMPLES IN COINS.

	1.			2.			3.			4.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
From	12	13	6½	19	17	4¾	135	17	4½	176	13	10½
Take	11	7	4½	11	10	2¼	94	16	1¾	57	18	6¾
Ans.												

TROY WEIGHT.

RULE.—When the lower grains are greater, borrow from 24, adding the remainder to the upper, and carry 1 to the dwts.; when the lower dwts. are greater, borrow from 20, adding 1 to the ounces; when the lower ounces are greater, borrow from 12, and carry 1 to the lbs.; and subtract the lbs. as in simple subtraction.

* REASON.—The one which is added to the next place of the lesser number diminishes the correspondent place of the greater. It is taking from one and adding to another which keeps the total correct.

EXAMPLES.

	lb.	oz.	dt.	gr.		lb.	oz.	dt.	gr.		lb.	oz.	dt.	gr.
1.—From	5	6	13	14	2.—From	347	11	12	6	3.—From	197	11	13	13
Take	3	4	6	8	Take	279	10	17	8	Take	178	10	17	10
Ans.					Ans.					Ans.				

Repeat the rule and reason for Subtracting in Troy Weight. The reason will apply in all cases in Compound Subtraction.

AVOIRDUPOIS WEIGHT.

RULE.—When the lower drs. are greater, borrow from 16; when the lower ounces are greater, borrow from 16; when the lower lbs. are greater, borrow from 28; when the lower qrs. are greater, borrow from 4; when the lower cwts. are greater, borrow from 20; observing, in each case, to add the remainder to the upper number, and the tons as in simple subtraction.

EXAMPLES.

	1.					2.						3.				
	cwt.	qr.	lb.	oz.	dr.	t.	cwt.	qr.	lb.	oz.	dr.	t.	cwt.	qr.	lb.	oz.	dr.
From	16	3	14	5	14	16	16	2	14	13	13	23	17	3	19	12	12
Take	12	1	8	4	8	12	18	3	19	15	15	17	18	3	23	13	13
Ans.						Ans.						Ans.					

Repeat the rule and reason for Avoirdupois Weight.

CHEMISTS' WEIGHT.

RULE.—When the lower grs. are greater, borrow from 20; when the lower scrs. are greater, borrow from 3; when the lower drs. are greater, borrow from 8; when the lower ounces are greater, borrow from 12; and the lbs. as in simple subtraction.

EXAMPLES.

	1.					2.					3.				
	lb.	oz.	dr.	scr.	gr.	lb.	oz.	dr.	scr.	gr.	lb.	oz.	dr.	scr.	gr.
From	19	8	7	2	19	24	6	5	1	16	27	5	6	1	17
Take	15	5	5	1	16	19	8	7	2	19	23	7	7	1	10
Ans.						Ans.					Ans.				

Repeat the rule and reason for Chemists' Weight.

LIQUID MEASURE.

Rule.—When the lower pints are greater, borrow from 2; when the lower quarts are greater, borrow from 4; when the lower gallons are greater, borrow from 63: when the lower hogsheads are greater, borrow from 4; and the tuns as in simple subtraction.

EXAMPLES.

	1.					2.					3.				
	t.	hhd.	g.	q.	p.	t.	hhd.	g.	q.	p.	t.	hhd.	g.	q.	p.
From	140	3	56	2	1	163	2	56	1	0	176	3	23	1	1
Take	131	2	50	1	1	94	3	61	1	1	100	3	39	1	1
Ans.						Ans.					Ans.				

Repeat the rule and reason for subtracting in Liquids.

DRY MEASURE.

Rule.—When the lower pints are greater, borrow from 2, carry 1 to the quarts; when the lower quarts are greater, borrow from 4, carry 1 to the gallons; when the lower gallons are greater, borrow from 2, carry 1 to the pecks; when the lower pecks are greater, borrow from 4, carry 1 to the bushels; when the lower bushels are greater, borrow from 8, and carry 1 to the quarters.

EXAMPLES.

	1.						2.						3.					
	qrs.	b.	p.	g.	q.	p.	qrs.	b.	p.	g.	q.	p.	qrs.	b.	p.	g.	q.	p.
From	136	7	3	1	3	1	204	6	2	0	2	0	311	6	3	1	3	1
Take	52	2	1	0	2	0	19	6	3	1	1	1	304	7	2	1	1	1
Ans.							Ans.						Ans.					

Repeat the rule and reason for subtracting in Dry Measure.

SQUARE OR LAND MEASURE.

Rule.—When the lower feet exceed the upper, borrow from 9, and carry 1 to the yards; when the lower yards are greater, borrow from 49, and carry 1 to the poles or perches; when the poles in the lower line exceed the upper, borrow from 40, and carry 1 to the roods; when the roods in the lower line are greater, borrow from 4, and carry 1 to the acres; and the acres as in simple subtraction.

EXAMPLES.

	a.	r.	p.	y.	f.		a.	r.	p.	y.	f.
1.—From	100	2	36	16	7	2.—From	114	1	21	15	16
Take	97	1	30	14	5	Take	74	2	36	16	0
Ans.						Ans.					

CLOTH MEASURE.

RULE.—In the nails, borrow from 4, and carry 1 to the quarters; in the quarters, borrow from 4, and carry 1 to the yards; and the yards as in whole numbers. In such cases, add the remainder to the upper number.

EXAMPLES.

	e.E.	yd.	qr.	n.
1.—From	73	2	1	2
Take	29	0	1	0
Ans.				

	yd.	qr.	n.
2.—96	1	1	
48	2	2	
Ans.			

	e.E.	yd.	qr.	n.
3.—127	1	2	1	
67	2	2	3	
Ans.				

LONG MEASURE.

RULE.—In the barleycorns, borrow from 3, and carry 1 to the inches; in the inches, borrow from 12, and carry 1 to the feet; in the feet, borrow from 3, and carry 1 to the yards; in the yards, borrow from 7 Irish, and from 5½ English, and carry 1 to the perches; in the perches, borrow from 40, and carry 1 to the furlongs; in the furlongs, borrow from 8, and carry 1 to the miles.

EXAMPLES.

	m.	f.	p.	y.
1.—From	19	3	36	3
Take	12	5	38	2
Ans.				

	m.	f.	p.	y.
2.—212	2	10	2	
111	1	11	1	
Ans.				

	m.	f.	p.	y.
3.—116	6	5	3	
110	7	3	4	
Ans.				

TIME.

RULE.—In the seconds, borrow from 60, and carry 1 to the minutes; in the minutes, borrow from 60, and carry 1 to the hours; in the hours, borrow from 24, and carry 1 to the days; in the days, borrow from 7, and carry 1 to the weeks; in the weeks, borrow from 4, and carry 1 to the months; in the months, borrow from 12, and carry 1 to the years; and the years as in simple subtraction.

EXAMPLES.

1.

	y.	m.	w.	d.
From	1741	8	2	3
Take	1535	9	3	5
Ans.				

2.

	y.	m.	w.	d.	h.	m.	s.
	6542	6	3	5	13	40	20
	4765	9	3	6	18	54	37
Ans.							

3.

	y.	m.	w.	d.	h.	m.	s.
	56	7	3	4	9	20	10
	37	9	1	6	10	38	21
Ans.							

A NEW TABLE, SHOWING THE NUMBER OF DAYS BETWEEN ANY TWO GIVEN TIMES.

PROBLEM.—To find the number of days from the 1st of January to the 11th of July.

RULE.—To the right hand of July you will find 181 days, to which add the 11 days of July, and you have 192, the number of days required.

How many days from the 9th of May to the 17th of September?—Opposite May in the column you will find 120, to which add 9=129; opposite September you will find 243, to which add 17=260; then from 260 take 129: the remainder will be 131,—the number of days sought.

DAYS.		MONTHS.	DAYS.	
31	334	January...	00	31
59	306	February.	31	28
90	275	March	59	31
120	245	April	90	30
151	214	May	120	31
181	184	June	151	30
212	150	July	181	31
243	122	August ...	212	31
273	92	September	243	30
304	61	October...	273	31
334	31	November.	304	30
365	00	December.	334	31

4.—How many days from the 5th of November, 1847, to the 16th of May, 1848?—Add 25, complement of 5 to 30 (days in November) to 31 found on the left hand of November, and to that sum add 120 found opposite May—more 16 for May, and you have 192, the days required?

To ascertain the length of Day and Night at any time of the Year.

RULE.—Double the time of the sun's rising, and it will give the length of the night; double the time of setting, and it will give the length of the day.

EXAMPLE.

1.—The Prince of Wales was born on the 9th of November, 1841; the sun rose at 7.10, and set at 4.50; what was the length of the day and night?

Set at	4 50	Rose at	7 10	Day	9 40
	2		2	Night	14 20
Length of day.	9 40	Length of Night.	14 20	Hours.	24 0 Proof.

COMPOUND MULTIPLICATION

Teaches to find the product of any number of divers denominations repeated a number of times.

CASE 1.

RULE.—Begin to multiply the lowest denomination by the quantity, and reduce it to the next higher; carry as many of the higher as it *contains to the next*, and so proceed from one denomination to another.

EXAMPLES.

	1.				2.				3.			
	£	s.	d.		£	s.	d.		£	s.	d.	
2 yds at	1	12	6½	per yd.	13	12	9¾	by 9	14	13	7½	by 7
			2				9				7	
Ans.	3	5	1	Ans.	122	15	8¼	Ans.	102	15	2¾	

4.—4 yards of cloth, at 17s. 6½d. per yard? Ans. £3 10s. 2d.
5.—5 cwt. of sugar, at £3 0s. 6d. per cwt.? Ans. £15 2s. 6d.
6.—7 yards of linen, at 7s. 10d. per yard? Ans. £2 14s. 10d.

CASE 2.

RULE.—If the number be composite, multiply the price by one of the components, and that product by the other, and you will have the amount.

EXAMPLES.

1.—16 cwt. of Russian tallow, at £1 18s. 8d. per cwt.?
× £1 18s. 8d. by 4 = £7 14s. 8d. × 4 ... ... = £30 18s. 8d. Ans.
2.—14 cwt., at 6s. 7½d. per cwt.? Ans. £4 13s. 0½d.
3.—72 cwt., at 15s. 9d. per cwt.? Ans. £56 14s.
4.—96 cwt., at 1s. 10½d. per cwt.? Ans. £9 2s.

CASE 3.

If the quantity be not a Composite Number.

RULE.—Multiply the nearest composite you can find: if more, subtract; but if less, add so many times the price of one for the amount.

EXAMPLES.

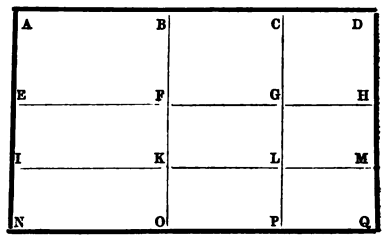
1.—75 yards, at 6s. 9¾d. × by 9 = £3 1s. 8¾d. × by 8 = £24 10s. 6d.; £1 0s. 5½d. for 3 yds. + to £24 10s. 6d. = £25 10s. 11½d. Ans.
2.—46 yards, at 4s. 7½d. per yard? Ans. £10 11s. 9½d.
3.—79 yards, at 7s. 10d. yer yard? Ans. £30 18s. 10d.

MULTIPLICATION OF WEIGHTS AND MEASURES.

EXAMPLES.

1.—Multiply 14 lbs. 10 oz. 0 dwts. 21 grs. by 4? Ans. 59 lbs. 4 oz. 3 dwts. 12 grs.
2.—Multiply 17 tons 17 cwts. 0 qrs. 24 lbs. by 2? Ans. 35 tons 14 cwts. 1 qr. 20 lbs.
3.—Multiply 14 cwts. 0 qrs. 21 lbs. 0 oz. 14 drs. by 7? Ans. 99 cwts. 1 qr. 7 lbs. 6 oz. 2 drs.
4.—Multiply 10 lbs. 6 oz. 4 drs. 1 sc. 17 grs. by 9? Ans. 94 lbs. 11 oz. 1 dr. 1 sc. 13 gr.
5.—Multiply 127 yds. 0 qrs. 3 n. by 12? Ans. 1526 yds. 1 qr.

A new Diagram, illustrating the principle of all duodecimal multiplication, proving the multiplication of pounds, shillings, and pence by the same; cwts., qrs., and lbs. by the same; feet, inches, and parts by the same, etc., etc.



1.—Let there be two numbers of three denominations given, and let A F be the square or the rectangle, made of the greatest denomination in both numbers; E K and B G two rectangles, made by multiplying the 1st denomination by the 2nd; the product divided by the integer of the greatest denomination reduced into the parts of the 2nd; the quotient will be of the same name with the greatest, and the remainder of the same name with the 2nd.

2.—F L is the square of the 2nd denomination; which, being divided by an integer of the greatest, reduced into the parts of the 2nd, the quotient will be of the same denomination as the 2nd; and if there be a remainder, it must be multiplied by a number, which, in the 3rd denomination, is equal to an integer in the 2nd—the quotient will be of the 3rd denomination; and if there be still a remainder, it must be multiplied by a number, which, in the 4th denomination, is equal to an integer in the 3rd; and divided as before, the quotient will be of the 4th denomination, and so on till the remainder cannot be reduced to any lower terms; thus you have the square or rectangle A C I L.

3.—C H and I O are two rectangles made by the multiplication of the sum of the greatest denomination given, by the sum given, which is of the 3rd lower denomination; the product will be of the same denomination with the 3rd; and, therefore, if that product be greater than the integer of the 2nd denomination, reduced into parts of the 3rd, it must be divided by a number, which, in the 3rd denomination, is equal to an integer in the 2nd; the quotient will be of the 2nd denomination, and the remainder of the 3rd.

4.—G M and K P are two rectangles made by multiplying the sum of the 2nd denomination by the 3rd; and the product being divided by one of the integers in the greatest denomination, reduced into parts of the 2nd, the quotient will be of the same denomination with the 3rd; and the remainder must be multiplied by a number, which in the 4th denomination is equal to an integer in the 3rd; the quotient will be of the 4th denomination; and the remainder will be the number of a fraction, whose denominator is that of the former divisor.

5.—L Q is the square of the 3rd denomination, which must be divided by one integer of the greatest denomination, reduced into the parts of the 3rd; the quotient will be of the 4th lesser denomination, and the remainder will be the numerator of a fraction, whose denominator is the same *divisor.*

PROBLEM 1.

To multiply pounds, shillings, and pence by the same; a pound being the integer.*

RULE.—Pounds × by pounds produce pounds. Pounds × by shillings, every 20 is a pound, the rest is shillings. Pounds × by pence, every 12 is a shilling, and the rest pence. Shillings × by shillings, every 20 is a shilling, every 5 is threepence, and each 1 is two farthings and four-tenths of a farthing. Shillings × by pence, every 5 is a farthing, and each 1, two-tenths of a farthing. Pence × by pence, every 60 is a farthing, and every 6 one-tenth of a farthing.

EXAMPLES.

1.—Multiply £3 5s. 6d. by £2 12s. 9d.

EXPLANATION.

First, say, £2 by £3 make £6; 2ndly, £2 by 5s. is 10, and £3 by 12 is 36, whose sum is 46, which by the 2nd direction, will be £2 6s.; 3rdly, £2 by 6d. is 12, and £3 by 9d. is 27, whose sum is 39, which, by direction the 3rd, will be 3s. 3d.; 4thly, 12s. by 5s. is 60, which, by direction the 4th, will be 3s.; 5thly, 12s. by 6d. is 72, and 5s. by 9d. is 45, whose sum is 117, which, by direction the 5th, will be 5¾d. and two-fifths; 6thly, 6d. by 9d. is 54, which, by direction the 5th, will be nine-tenths. Add the whole, and you will find £8 12s. $9\frac{3}{10}$d., as required.

Operation.

£	s.	d.	
3	5	6	
2	12	9	
6			
2	6		
	3	3	
	3		
		$5\frac{3}{4}$	$\frac{2}{5}$
			$\frac{9}{10}$
Ans. £8	12	$9\frac{3}{10}$	

2.—Multiply 2s. 6d. by 2s. 6d., a pound being the integer?

1st by Decimals.

2s. 6d. or ⅛ of a ponnd is ·125
·125

625
250
125

Ans. ·15625 = 3¾d.

2nd by Vulgar Fractions.

× ⅛ by ⅛ = (1/64) ÷ 240d. = 3¾d.
Proof.

NOTE.—It will be seen by the above, that to multiply 2s. 6d. by 2s. 6d., taking a pound as the integer, the result will be 3¾d.; but to multiply the same by the same, taking a shilling as the integer, it produces 6s. 3d. By an attentive perusal of the illustration of the new diagram, the demonstration in both cases will appear clear.

* The multiplication of money by money is looked upon as at variance with good taste; but critics so frequently propose the question, that the author has taken a good deal of trouble to satisfy the desire of those who argue that pounds, shillings, and pence admit of the same solution as feet, inches, and parts. To those who still stumble at the problem, the author begs to refer them to "Euclid's Elements." Cross multiplication cannot be, properly speaking, proved without a knowledge of the foregoing diagram.

*To multiply 2s. 6d. by 2s. 6d., a shilling being the integer.**

RULE.—Shillings × by shillings produce shillings; shillings × by pence, every twelve is a shilling, and the rest pence; shillings × by farthings produce farthings; pence × by pence, every twelve is a penny, and each three a farthing; pence × by farthings, each twelve is a farthing, and every three is a quarter of a farthing; farthings × by farthings, each twelve is a quarter of a farthing.

3.—Multiply 2s. 6d. by 2s. 6d., the integer being a shilling?

EXPLANATION.	*Operation.* s.	d.
× 2s. by 2s. make 4s., and 2s. by 6d. is 12, and twice 12	2	6
make 24, which is 2s.; then 6d. by 6d. is 36=3d. and all	2	6
added=6s. 3d.	4	0
	2	0
		3
The rule applied in Timber Measure.	Ans. 6	3

4.—In a plank 8 ft. 7 in. 4 pts. long, and 5 ft. 9 in. 8 pts. broad, how many feet?

	ft.	in.	p.		
	8	7	4		
	5	9	8		
	43	0	8		
	6	5	6	0	
		5	8	10	8
Feet.	49	11	10	10	8 Ans.

COMPOUND DIVISION

Is dividing compound numbers into any proposed number of equal parts.

RULE.—Begin to divide the highest denomination; if anything remain, you must find how many of the next lower denomination that remainder is equal to, and add them to the next numbers of the same denomination; and so proceed with each denomination till the end.

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*CASE 1.

2s. 6d. is $\frac{1}{8}$, and $\frac{1}{8}$ × by $\frac{1}{8}=\frac{1}{64}$, and $\frac{1}{64}$ of 240d. is=3$\frac{3}{4}$d. Proof.

CASE 2.

2$\frac{1}{2}$ × by 2$\frac{1}{2}=6\frac{1}{4}$, and $6\frac{1}{4}=\frac{25}{4}$; and $12=\frac{48}{4}$; $\frac{25}{4}$ of $\frac{48}{4}=\frac{1200}{16}=75$d.= *6s. 3d.* Proof.

EXAMPLES IN MONEY.

1.				2.				3.			
£.	s.	d.		£.	s.	d.		£	s.	d.	
+2) 225	2	4	by 2	+3) 751	14	7½	by 3	+4) 821	17	9½	by 4
Ans. 112	11	2		Ans. 250	11	6½		Ans. 205	9	5⅛	

4.—Divide £64 19s. by 36?—Ans. £1 16s. 1d.

5.—Divide £190 4s. 6d. by 42?—Ans. £4. 10s. 7d.

6.—Divide £37 14s. 8d. by 48?—Ans. 14s. 8¾d.

7.—Divide £4567 0s. 10d. by 55?—Ans. £83 0s. $8\frac{10}{11}$d.

8.—Bought 36 yds. of cloth for £17 2s.; what was it a yd.?—Ans. 9s. 6d.

EXAMPLES IN WEIGHTS AND MEASURES.

9.—Divide 8 lbs. 1 oz. 15 dwts. 8 grs. by 2?—Ans. 4 lbs. 0 oz. 17 dwts. 16 grs.

10.—Divide 24 tons 14 cwts. 0 qrs. 14 lbs. by 3?—Ans. 8 tons 4 cwts. 2 qrs. 23½ lbs.

11.—Divide 147 yds. 2 ft. 11 ins. by 10?—Ans. 14 yds. 2 ft. $4\frac{7}{10}$ ins.

12.—Divide 24 hhds. 57 gals. by 11?—Ans. 2 hhds. 16 gals. 2 qts. $1\frac{1}{11}$pt.

Repeat the Rule for Compound Division. To prove Compound Division, multiply the quotient by the divisor, and if right, the result will be equal to the dividend.

ANALYZED COMPENDIUMS OF THE FOREGOING RULES.

PROBLEM 1.

The price of one being given in any even number of shillings, to find for any number of lbs., yards, &c.

RULE.—Annex a cipher to the right hand of the given money, and divide by half the price.

EXAMPLES.

1.—If a yard of cloth cost 8s., how many yards may be bought for £16?

£
+ 4)160

Ans. 40 yards.*

2.—How many yards of linen, at 6s. per yard, can I have for £48? Ans. 160 yards.

3.—How many cwt. of sugar can I have for £80, if it be sold at 30s. per cwt.? Ans. 53 cwts. 1 qr. 9½ lbs.

4.—How many cwt. of butter, at 42s. per cwt., can I buy for £126? Ans. 60 cwts.

QUERIES.—The price of one being given in even shillings, how will you find the amount of any number of cwts., yards, &c.? Repeat the Rule.

* This plan obviates the Rule of Three.

PROBLEM 2.

To compute, yards, quarters, ells, nails, lbs., gallons, &c., at any given number of pence, from ¼d. to 11¾d. per yard, &c.

GENERAL RULE.—Find the amount at a penny, and multiply by the number of pence.

EXAMPLES.

1.—12lbs. at 7d. per lb.: say 12d. are 1s., and 7 times 1 are 7s. Ans.
2.—48lbs. at 9d. per lb.: 48d. are 4s., and 9 times 4 are £1 16s. Ans.
3.—84lbs. at 7d. per lb.: 84d. are 7s., and 7 times 7 are £2 9s. Ans.
4.—132lbs. at 11d. per lb.: 132d. are 11s., and 11 times 11 are £6 1s. Ans.
5.—252 gallons at 10d. per gallon: 252d. are 21s. × by 10 are £10 10s. Ans.
6.—300lbs. at 7d. per lb.: 300d. are 25s. × by 7 are £8 15s. Ans.

When fractions occur in the quantity, for a ¼ allow a ¼d.; for a ½ a ½d., etc.

7.—42½lbs. at 7d. per lb.: 42½d. are 3s. 6½d., × by 7=£1 4s. 9½d. Ans.
8.—65¼ ozs., at 5d. per oz.: 65¼d. are 5s. 5¼d. × by 5=£1 7s. 2¼d. Ans.
9.—87¾lbs. at 8d.: 87¾d. are 7s. 3¾d. × by 8=£2 18s. 6d. Ans.
10.—99⅛ yds., at 4d. per yd.. 99⅛d. are 8s. 3⅛d. × by 4=£1 13s. 0½d. Ans.
11.—140⅜ ozs., at 7d. per oz.: 140⅜d. are 11s. 8⅜d × by 7=£4 1s. 10⅝d. Ans.
12.—88¼ lbs., at 7d. per lb.: 88¼d. are 7s. 4¼d. × by 7=£2 11s. 5¼d. Ans.
13.—27 quires of paper, at 9¼d. per quire: 27d. are 2s. 3d. × by 9¼= £1 0s. 9¾d. Ans.
14.—183⅛* yds. at 10d. per yd.: 183⅛d. are 15s. 3⅛d. × by 10=£7 13s. 0½d.

When a Fraction is in the Price.

RULE.—Call the lbs., yards, &c., pence, which bring to shillings and pence; multiply by the pence and fraction as follows:—

15.—48 lbs. at 7½d. per lb.: say 48d. are 4s. × by 7½=£1 9s. Ans.
16.—60 lbs., at 5½d. per lb.: 60d. are 5s. × by 5½d.=£1 7s. 6d. Ans.
17.—72 lbs., at 9¾d. per lb.: 72d. are 6s. × by 9¾=£2 18s. 6d. Ans.
18.—84 gals., at 11½d. per gal.: 84d. are 7s. × by 11½=£4 0s. 6d. Ans.
19.—96 yards, at 10¾d. per yard: 96d. are 8s. × by 10¾=£4 6s. Ans.

NOTE.—This rule is of importance to the accountant, and, it is expected, will be studied attentively, as it will be found of great service to young men and shopkeepers.

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* It is necessary here to explain the application of this rule in the fractions. One *example* will suffice for all: we make use of the question, No. 14, for the purpose; *the illustration will appear* clear to any capacity.

All mercantile affairs are transacted for money, and shillings and pounds being the principal denominations of the present currency, and so regulated that Twelve Pence make a Shilling, and Two Hundred and Forty Pence a Pound, the equations of these two Integrals embrace the whole of mercantile calculations.

NEW TABLE BY THE EQUATION OF TWELVE.

For	15	take 1	one-fourth times	12	For 85	take 7	one-twelfth times .. 12
..	17	 1	five-twelfth	12	.. 87	 7	one-fourth 12
..	19	 1	seven-twelfth	12	.. 89	 7	five-twelfth 12
..	20	 1	two-third	12	.. 91	 7	seven-twelfth 12
..	21	 1	three-fourth	12	.. 93	 7	three-fourth 12
..	22	 1	eleven-twelfth	12	.. 95	 7	eleven-twelfth 12
..	26	 2	one-sixth	12	.. 97	 8	one-twelfth 12
..	28	 2	one-third	12	.. 99	 8	one-fourth 12
..	29	 2	five-twelfth	12	.. 101	 8	five-twelfth..... 12
..	31	 2	seven-twelfth	12	.. 103	 8	seven-twelfth..... 12
..	33	 2	three-fourth.....	12	.. 105	 8	three-fourth 12
..	35	 2	eleven-twelfth	12	.. 107	 8	eleven-twelfth 12
..	37	 3	one-twelfth	12	.. 109	 9	one-twelfth..... 12
..	39	 3	one-fourth.....	12	.. 111	 9	one-fourth 12
..	41	 3	five-twelfth	12	.. 113	 9	five-twelfth..... 12
..	43	 3	seven-twelfth	12	.. 115	 9	seven-twelfth..... 12
..	45	 3	three-fourth.....	12	.. 117	 9	three-fourth 12
..	47	 3	eleven-twelfth.....	12	.. 119	 9	eleven-twelfth 12
..	50	 4	one-sixth	12	.. 121	10	one-twelfth..... 12
..	52	 4	one-third	12	.. 123	10	one-fourth 12
..	54	 4	one-half.....	12	.. 125	10	five-twelfth..... 12
..	55	 4	seven-twelfth	12	.. 127	10	seven-twelfth..... 12
..	57	 4	three-fourth.....	12	.. 129	10	three-fourth 12
..	59	 4	eleven twelfth	12	.. 131	10	eleven-twelfth 12
..	61	 5	one-twelfth	12	.. 133	11	one-twelfth..... 12
..	63	 5	one-fourth	12	.. 135	11	one-fourth 12
..	65	 5	five-twelfth	12	.. 137	11	five-twelfth..... 12
..	67	 5	seven-twelfth	12	.. 139	11	seven-twelfth..... 12
..	69	 5	three-fourth	12	.. 141	11	three-fourth 12
..	71	 5	eleven-twelfth	12	.. 143	11	eleven-twelfth 12
..	73	 6	one-twelfth	12	.. 145	12	one-twelfth..... 12
..	75	 6	one-fourth	12	.. 147	12	one-fourth 12
..	77	 6	five-twelfth	12	.. 149	12	five-twelfth..... 12
..	79	 6	seven-twelfth	12	.. 151	12	seven-twelfth..... 12
..	81	 6	three-fourth.....	12	.. 153	12	three-fourth 12
..	83	 6	eleven-twelfth	12	.. 155	12	eleven-twelfth 12

NOTE.—If the pupil make himself conversant with the above table, he

* We have here 183⅓ yards, at 10d. per yard,—

183⅓=15s. 3⅓d., and 15s. 3⅓d. × by 10 stands thus:—

10

Ans. £7 13 0⅓

Multiply first the numerator of the fraction by 10, saying 10 times ⅓ are 50-8ths, which is 6 whole numbers, and 2-8ths or ¼; we write down ¼ and carry 6 to the pence; multiply the pence and shillings in the ordinary way, and so on with any other number. Remember, after multiplying the numerator, divide by the denominator, the quotient will be so many pence; set down the remaining fraction in its proper place, and carry to the pence.

will be able in an instant, to tell the amount of any quantity, at any price, from 12 to 240. It was constructed for the system, in order to facilitate the calculation of either even, odd, evenly even, evenly odd, oddly odd, composite, plain, solid, perfect, harmonic, and square numbers, in any case, as far as 12 reaches.

EXERCISE I.

The value of one article given to determine the price of any proposed number of the same kind, by the equation of twelve.

THIS proposition, and its equivalent, developes the whole system of mercantile calculations, and can be briefly analyzed into three particular cases.

First, the number whose value is required, must be either equal, greater or less than 12. If 12, it admits of but one infallible rule; if less, of three; and if greater, of four operative ones.

With respect to the particular cases: observe, that a number less than 12, may be an exact measure of 12, or prime to it; also, a number greater than 12 may be the multiple of 12, or prime to it. Each of these cases will be minutely considered, and carefully arranged under its distinct head; and as 12 is the equation to this exercise, we shall first take it into consideration.

GENERAL RULE.—Call the pence which one costs shillings. If a halfpenny farthing, or three farthings, be affixed to the price, call the halfpenny sixpence, and count three pence for each farthing. If fractions occur, for $\frac{1}{3}$, say 1½d.; $\frac{2}{3}$, 4½d.; $\frac{5}{6}$, 7½d.; $\frac{1}{12}$, 1d.; $\frac{3}{12}$, 3d.; $\frac{7}{12}$, 7d.; $\frac{1}{6}$, 2d.; $\frac{4}{6}$, 10d.; $\frac{1}{16}$, $\frac{3}{4}$d.; $\frac{1}{32}$, $\frac{3}{8}$d.

The *Reason* of this rule is founded on the general principle. If a yd. cost 1d., one shilling will be the cost of 12 yds., that is, a shilling to the penny. Hence, as many pence as a yd. cost, so many shillings will 12 yds. cost. If a yd. cost a halfpenny, 12 yds. will cost sixpence; and if a yd. cost a farthing, 12 yds. will cost threepence, and compute the fractions as *per rule.*

PROBLEM 1.

Knowing the price of 1, *to find the value of* 12, *as per rule.*

EXPLANATION.

1.—If a lb. of sugar cost 7d. what will 12 lbs. cost? Call the 7d. seven shillings, and you have the amount, 7s. Ans.

2.—If 1 yd. cost 6½d. what will 12 yds. cost? Call the 6d. six shillings, and the halfpenny sixpence = 6s. 6d. Ans.

3—If a yard cost 9¼d. what will 12 yards come to? Call the 9d. nine shillings, and 3d. for the farthing = 9s. 3d. Ans.

4.—If a yard cost 5¾d. what will 12 yards come to? Call the 5d. five shillings, and count 9d. for the three farthings = 5s. 9d. Ans.

Finally, if the price per yard should amount to shillings, pence, &c., reduce the shillings and pence to pence; which call shillings, and you have the amount of 12 yards, as per rule.

A few examples will render this exercise familiar, which the learner is particularly cautioned not to pass over until he is able to tell at once, the amount of 12, at any proposed price per integer.

EXAMPLES.

1.—At 17½d. per yard, what is the value of 12 yards? 12 at 17½ = 17s. 6d. Ans.

2.—At 15¾d. per lb., what is the value of 12 lbs.? Ans. 15s. 9d.

3.—12 pieces of calico, at 5s. 3¾d. per piece? Ans. £3 3s. 9d.

4.—12 doz. of ribbon, at 4s. 7½d. per dozen? Ans. £2 15s. 1½d.

5.—12 lbs. of thread, at 1s. 11⅝d. per lb.? Ans. £1 3s. 10d.

6.—12 pieces of lawn, at 13s. 9½d. per piece? Ans. £8 5s. 10½d.

7.—12 oz. of silver, at 4s. $7\frac{3}{16}$d. per ounce? Ans. £2 15s. 2¼d.

PROBLEM 2.

To calculate the amount of any number, from 12 *to* 24.

RULE 2.—Call the pence, &c., which one article cost, shillings, which increase by the same part of itself that the excess is of 12, if the excess be an exact measure of 12; but if prime, add the value of the prime part; the sum will be the value of the proposed number.

EXAMPLES.

1.—What is the value of 18 lbs. of beef, at 5½d. per lb.? Ans. 8s 3d.

12 @ 5½d.	=	5s. 6
6 = ½	=	2s. 9d.
18	=	8s. 3d. Ans.

2.—What is the price of 17 lbs. of butter, af 13¼d. per lb.? Ans. 18 9½d.

3.—What will 23 lbs. of tea cost, at 6s. 7½d. per lb.? Ans. £7 12s. 4½d.

4.—What is 13¾ gals. of brandy worth, at 15s. 9½d. a gal.? Ans. £10 17s. 1½d.

5.—What is 19⅛ rms. of paper worth, at 7s. 9½d. per rm.? Ans. £7 12s. 4½d.

6.—What will 23½ lbs. of leather come to, at 2s. 8½d. per lb.? Ans. £3 3s. 7½d.

PROBLEM 3.

The reverse; having the amount of twelve, to find the price of one.

RULE 3.—As many shillings as twelve are worth, so many pence will one cost.

EXAMPLES.

1.—If 12 pigeons cost 8s., what is one worth? 8s.=8d. Ans.
2.—If 12 yards of linen cost 16s., what is the price of one? Ans. 1s. 4d.
3.—If 12 pairs of stockings cost 4s. 8d., what is that a pair? Ans. 4⅔d.
4.—Bought 12 gallons of cider for £1, what is that a gallon? Ans. 1s. 8d.
5.—12 handkerchiefs at 30s., what are they a piece? Ans. 2s. 6d.
6.—Paid £6 for a dozen hats, what was that for one? Ans. 10s.
7.—If a dozen of gloves cost £2 16s., what is that a pair? Ans. 4s. 8d.
8.—12 cloth caps for £1 7s., what is that for one? Ans. 2s. 3d.
9.—12 bottles of port wine cost £2 8s., what is that a bottle? Ans. 4s.

PROBLEM 4.

To calculate for any multiple of 12, *or for any number that contains* 12, *evenly, the price of one being given.*

RULE 4.—Call the pence shillings, the halfpenny 6d., and count 3d. for every farthing, and the fractions, as taught in rule the first; which multiply by the number of twelves contained in the given number; the result will be the answer.

Reason.—When the price of one in pence is called shillings, it is the value of 12; and when the value of 12 is multiplied by the number of twelves, the result is the amount of the integer.

EXAMPLES.

1.—What is the price of 24 yards of calico, at 3¾d. per yard?

Write 3s. 9d. for 3¾d., and it is the value of 12, per rule the first; and this multiplied by 2, the number of twelves contained in the given number is the answer.

Thus.—3¾d. = 3s. 9d. × 2 = 7s. 6d. Ans.

2.—What are 24 lbs. of cheese worth, at 6½d. per lb.? Ans. 12s. 6d.
3.—What are 36 lbs. of mutton worth, at 4½d. per lb. Ans. 13s. 6d.
4.—72 lbs. of lamb, at 9½d.? Ans. £2 15s. 6d.
5.—84 yards of silk velvet, at 9s. 8¾d. per yard? Ans. £40 17s. 3d.
6.—96 parlour locks, at 3s. 7½d. each? Ans. £17 8s.
7.—120 pairs of gloves, at 2s. 3½d. a pair? Ans. £13 15s.
8.—120 gallons of rum, at 13s. 10d. per gallon? Ans. £83.
9.—132 quarters of barley, at £1 13s. 9d. per quarter? Ans. £222 15s.
10.—108 yards of cashmere, at 2s. 9½d. per yard? Ans. £15 1s. 6d.

QUERY.—How do you calculate the amount of any multiple of 12? Give the rule *and the reason.*

PROBLEM 5.

Having the price of any number of which 12 *is a multiple, to find the price of one.*

Rule 5.—Find how many twelves are contained in the number of articles; then bring the amount into shillings, and divide by the number of twelves; the result will be the price of one in pence.

EXAMPLES.

1.—Bought 48 pairs of scissors for £1 4s., what is that a pair?

	£	s.		s.
48 = 4 times	12	1	4 =	24
			÷ ¼)	——
				6d. Ans.

2.—72 yards of drab cloth, for £3 6s., what is that a yard? Ans. 11d.
3.—48 chair covers, for £1 16s., what was the price of one? Ans. 9d.
4.—60 brass finger plates, for £7 10s., what is one worth? Ans. 2s. 6d.
5.—120 flower pots, for £2, what is one worth at that rate? Ans. 4d.
6.—132 wine glasses, for £4 19s., what is the price of one? Ans. 9d.
7.—108 pieces of dinner service, for £2 5s., what is that a piece? Ans. 5d.
8.—96 glass frames, for £62 16s., what is that a piece? Ans. 13s. 1d.

Repeat the rule for finding the price of any number of which 12 is a multiple, the price of one being given.

PROBLEM 6.

The price of one given, to find the amount of an aliquant number greater than 12, *at the same rate.*

Rule 6.—Set down the price of twelve; multiply by the number of twelves contained in the given number, to which add or subtract the amount of the odd numbers, and you have the answer.

EXAMPLES.

1.—What is the amount of 25½ stones of wheat, at 17½d. per stone?

d.		£	s.	d.			£	s.	d.
17½	=	0	17	6	× 2	=	1	15	0
					+ 1½	=	0	2	2½
							£1	17	2½ Ans.

2.—73 lbs. of butter, at 6½d. per lb? Ans. £1 19s. 6½d.
3.—85 lbs. of beef, at 3½d. per lb.? Ans. £1 3s. 0½d.
4.—137 lbs. of worsted, at 17½d. per lb.? Ans. £9 19s. 9½d.
5.—90 lbs. of tobacco, at 3s. 6½d. per lb.? Ans. £15 18s. 9d.
6.—104 yards of broad cloth, at 8s. 6½d. per yard? Ans. £44 10s. 6d.
7.—47 cwt. of fine flour, at 16s. 8½d. per cwt.? Ans. £39 5s. 3½d.
8.—76 gallons of rum, at 14s. 8½d. per gallon? Ans. £55 17s. 10d.
9.—52 acres of land, at £1 3s. 6d. per acre? Ans. £61 2s.

QUERY.—To find the amount of any number, greater than 12, but prime to it, how do you proceed? Give the Rule.

PROBLEM 7.

To compute for any given quantity, at shillings and pence.

RULE.—Bring the shillings and pence to pence, which call shillings; multiply by $\frac{1}{12}$ of the quantity, if even, or by the nearest number of twelves therein; if odd, then add or subtract for the odd numbers, and you have the answer.

EXAMPLES.

1.—What is the amount of 60 yards of velvet, at 6s. 6½d. per yard?

s.	d.		£	s.	d.
6	6½d.	=	3	18	6
					5
			£19	12	6 Ans.

What is the price of 108 yards of French silk, at 10s. 10d. per yard? £58 14s. 6d. Ans.

2.—107 lbs. of gunpowder tea, at 4s. 11½d. per lb.? £140 3s. 4d. Ans.

3.—145 yds. of West of England cloth, at 19s. 4d. per yd.? £140 3s. 4d.

4.—147 silk kerchiefs, at 7s. 9½d.? £57 8s. 5½d. Ans.

5.—133 French hats, at 15s. 4d. a piece? £101 19s. 4d. Ans.

6.—150 silk mantles, at 23s. 9d. a piece? £178 2s. 6d. Ans.

7.—153 ounces of gold, at 97s. 0½d. per ounce? £742 7s. 4½d. Ans.

EXERCISE II.

CALCULATION OF LACE.

THE lace trade generally comprises a variety of fractions, often presenting difficulties to both buyer and seller. The following examples will be found sufficient to facilitate the accountant in totting up the amount of any quantity, at any price per dozen, with the greatest despatch. The same method may be applied where fractions are annexed to the price of any other article.

RULE.—Apply the equation 12 as before directed. For $\frac{1}{6}$ count 1½d.; for $\frac{1}{16}$, ¾d.; for $\frac{1}{32}$, ⅜d.; for $\frac{1}{64}$, $\frac{3}{16}$d.; for $\frac{1}{128}$, $\frac{3}{32}$d.

EXAMPLES.

1.—What is the amount of 2 dozen of Nottingham lace, at 16$\frac{1}{16}$d. per yd.?

Operation.

	s.	d.		s.	d.
12 yards, at	1	4$\frac{1}{16}$	=	16	0¾ which double for 2 dozen.
					2
Ans.				£1	12 1½

2.—What will $2\frac{1}{2}$ doz. of edging come to, at $3\frac{1}{4}$d. per yard? Ans. 9s. $4\frac{1}{2}$d.
3.—$5\frac{1}{3}$ doz. of thread lace, at 1s. $10\frac{1}{3}\frac{1}{2}$d. per yard? Ans. £6 1s. $2\frac{1}{16}$d.
4.—$9\frac{1}{2}$ doz. figured lace, at $9\frac{3}{16}$d. per yard? Ans. £4 7s. $3\frac{3}{8}$d.
5.—$16\frac{1}{4}$ doz. of silk lace, at 5s. $7\frac{3}{8}$d. per yard? Ans. £54 14s. $10\frac{1}{2}$d.
6.—$23\frac{1}{8}$ doz. French lace, at 12s. $11\frac{5}{16}$d. per yard? Ans. £41 9s. $10\frac{1}{2}$d.
7.—$27\frac{3}{4}$ doz. flowered lace, at 3s. $2\frac{9}{32}$d. per yard? Ans. £53 2s. $3\frac{1}{32}$d.
8.—$47\frac{1}{4}$ doz. of Brussels lace, at 9s. $10\frac{9}{16}$d. per yd.? Ans. £280 2s. $0\frac{1}{16}$d.
9.—$76\frac{3}{4}$ doz. of blond lace, at 9s. $5\frac{7}{32}$d. per yd.? Ans. £434 9s. $6\frac{1}{32}$d.
10.—$127\frac{1}{2}$ doz. of fancy lace, at 2s. $1\frac{1}{16}$d. per yd.? Ans. £165 7s. $0\frac{1}{2}$d.

EXERCISE III.

PROBLEM 1.

To find the price of a gross, the price of an article being given.

RULE 1.—Reckon the pence in the price of one article shillings, the $\frac{1}{2}$d. 6d., and the $\frac{1}{4}$d. 3d. Multiply by 12, and you have the answer.

Reason.—Because taking the pence in the price as shillings is the same as multiplying by twelve, and multiplying these shillings again by 12, is the same as × 12 by 12 = 144 = one gross.

EXAMPLES.

1.—One gr., at $8\frac{1}{4}$d.
d. s. d. s.
$8\frac{1}{4}$ = 8 3 × by 12 = 99. Ans.
2.—One gr., at $9\frac{1}{2}$d.? Ans. 114s.
3.—One gr., at $11\frac{1}{4}$d.? Ans. 141s.
4.—One gr., at $12\frac{1}{2}$d.? Ans. 147s.
5.—One gr., at $13\frac{1}{4}$d.? Ans. 162s.
6.—One gr., at $16\frac{1}{2}$d.? Ans. 198s.
7.—One gr., at $19\frac{1}{4}$d.? Ans. 231s.
8.—One gr., at $23\frac{3}{4}$d.? Ans. 285s.

EXERCISE IV.

PROBLEM 1.

To find the price per score, the price of one being given.

RULE.—Call the shillings pounds, see what proportion the pence bear to the shillings, which you are to put in the place of shillings for the answer.

EXAMPLES.

1.—Twenty pairs of gold ear-rings, at 19s. 9d. per pair? Call the 19s. nineteen pounds, and 9d. being three-fourths of a shilling, call it three-fourths of a pound, or 15s = £19 15s. Ans.

2.—Twenty yards of broad-cloth, at 11s. 6d. per yard? Ans. £11 10s.
3.—Twenty volumes of Burns' Poems, at 13s. 9d. a piece? Ans. £13 15s.
4.—Twenty bibles, morocco binding, at 39s. 9d. a piece? Ans. £39 15s.
5.—Twenty sacks of flour, at £2 7s. 6d. a sack? Ans. 47 10s.
6.—Sixty mahogany chairs, stuffed, at £1 2s. 9d. a piece? Ans. £68 5s.
7.—One hundred silver tea spoons, at 11s. 4d each? Ans. £56 13s. 4d.

QUERY.—The price of one being given, how do you find the price of a score?

EXERCISE V.

PROBLEM 1.

To find the value of 100 *articles, the price of one being given.*

RULE.—For every farthing in the price, take twice as many shillings, and once as many pence, add these, and you have the answer.

Reason.—By taking a penny for every farthing, is the same as multiplying by four; because, by taking two shillings for every farthing, is the same as multiplying by ninety-six; and 96 + 4 = 100.

EXAMPLES.

1.—One hundred copy books, at 4½d. each?

d. f. £ s. s. d. £ s. d.
4½ = 18 × 2 = 1 16 + to 1 6 = 1 17 6. Ans.

2.—One hundred quarts of vinegar, at 1s. 3¾d. a quart? Ans. £6 11s. 3d.
3.—One hundred hearth brushes, at 2s. 3½d. a piece? Ans. £11 7s. 1d.
4.—One hundred silver chains, at 17s. 10¼d. each? Ans. £89 5s. 5d.
5.—One hundred yards of mason work, at 5¾d. a yard? Ans. £2 7s. 11d.
6.—One hundred guard chains, at 7s. 6¾d. a piece? Ans. £37 16s. 3d.
7.—One hundred yards of silk binding, at 14½d. a yard? Ans. £6 0s. 10d.

PROBLEM 2.

By knowing the amount of 100, *to find the price of one.*

RULE.—To eight times the amount add one-fifth of itself, and the sum is the answer in farthings.

EXAMPLES.

[illegible]one hundred articles cost £2 18s. 4d., what is one worth?
[illegible]d. £ s. d. £ s. d. £ s. d.
[illegible]6 × 8 = 23 6 8 ÷ 5 = 4 13 4 + 23 6 8 = 28 farthings, or 7d. Ans.
[illegible]0 yards cost £5 16s. 8d., what will one cost?
[illegible]. £ s. d. £ s. d. £ s. d.
[illegible]6 × 8 = 46 13 4 ÷ 5 = 9 6 8 + 46 13 4 = 56 farthings, or 14d. Ans.

3.—If 100 geese cost £11 13s. 4d., what is that a piece? Ans. 2s. 4d.
4.—If 100 lbs. of tea cost £27 10s., what will one cost? Ans. 5s. 6d.

NEW TABLE OF EQUATIONS FOR TWO HUNDRED AND FORTY.

As the table of 12, *with its equations, meet all calculations up to this stage, we now introduce the student to a new table, with the equations of* 240, *similarly constructed, which may be carried on to infinity.*

For 340	take	1 five-twelfth times.... 240	For 700	take	2 eleven-twelfth times 240
.. 350	....	1 eleven-twenty-fourth. 240	.. 710	....	2 twenty-three-24th.. 240
.. 360	....	1 one-half 240	.. 720	....	3 240
.. 370	....	1 thirteen-24th 240	.. 730	....	3 one-twenty-fourth .. 240
.. 380	....	1 seven-twelfth 240	.. 740	....	3 one-twelfth 240
.. 390	....	1 five-eighth 240	.. 750	....	3 one-eighth 240
.. 400	....	1 two-third 240	.. 760	....	3 one-sixth 240
.. 410	....	1 seventeen-24th 240	.. 770	....	3 five-twenty-fourth . 240
.. 420	....	1 one three-fourth 240	.. 780	....	3 one-fourth 240
.. 430	....	1 nineteen-24th..... 240	.. 790	....	3 seven-24th 240
.. 440	....	1 five-sixth..... 240	.. 800	....	3 one-third 240
.. 450	....	1 seven-eighth..... 240	.. 810	....	3 three-eight 240
.. 460	....	1 eleven-twelfth 240	.. 820	....	3 five-twelfth..... 240
.. 470	....	1 twenty-three-24th.... 240	.. 830	....	3 eleven-24th..... 240
.. 480	....	2 240	.. 840	....	3 one-half 240
.. 490	....	2 one-twenty-fourth .. 240	.. 850	....	3 thirteen 24th 240
.. 500	....	2 one-twelfth 240	.. 860	....	3 seven-twelfth 240
.. 510	....	2 one-eighth 240	.. 870	....	3 five-eighth 240
.. 520	....	2 one-sixth 240	.. 880	....	3 two-third..... 240
.. 530	....	2 five-twenty-fourth .. 240	.. 890	....	3 seventeen-24th 240
.. 540	....	2 one-fourth 240	.. 900	....	3 three-fourth 240
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.. 560	....	2 one-third 240	.. 920	....	3 five-sixth 240
.. 570	....	2 three-eighth 240	.. 930	....	3 seven-eighth..... 240
.. 580	....	2 five-twelfth 240	.. 940	....	3 eleven-twelfth 240
.. 590	....	2 eleven-twenty-fourth. 240	.. 950	....	3 twenty-three-24th.. 240
.. 600	....	2 one-half 240	.. 960	....	4 240
.. 610	....	2 thirteen-24th..... 240	.. 1000	....	4 one-sixth..... 240
.. 620	....	2 seven-twelfth..... 240	.. 1200	....	5 240
.. 630	....	2 five-eighth 240	.. 1440	....	6 240
.. 640	....	2 two-third 240	.. 1680	....	7 240
.. 650	....	2 seventeen-24th 240	.. 1920	....	8 240
.. 660	....	2 three-fourth 240	.. 2160	....	9 240
.. 670	....	2 nineteen-24th 240	.. 2400	....	10 240
.. 680	....	2 five-sixth 240	.. 2640	....	11 240
.. 690	....	2 seven-eighth 240	.. 2880	....	12 240

NOTE.—The pupil is recommended to pay particular attention to the foregoing table; its object is to facilitate the progress of those who wish to become expert calculators. The ingenious boy will see that the intermediate numbers can be found at once. The system is general, and will answer any number proposed. It will obviate the old Rule of Three and Practice systems; a hateful remembrance to those who have spent years over them, and terror to the tyro who has the dreary path before him.

2.—Twenty yards of broad-cloth, at 11s. 6d. per yard? Ans. £11 10s.
3.—Twenty volumes of Burns' Poems, at 13s. 9d. a piece? Ans. £13 15s.
4.—Twenty bibles, morocco binding, at 39s. 9d. a piece? Ans. £39 15s.
5.—Twenty sacks of flour, at £2 7s. 6d. a sack? Ans. 47 10s.
6.—Sixty mahogany chairs, stuffed, at £1 2s. 9d. a piece? Ans. £68 5s.
7.—One hundred silver tea spoons, at 11s. 4d each? Ans. £56 13s. 4d.

QUERY.—The price of one being given, how do you find the price of a score?

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.. 480	....	2 240	.. 840	....	3 one-half 240
. 490	....	2 one-twenty-fourth .. 240	.. 850	....	3 thirteen 24th..... 240
.. 500	....	2 one-twelfth 240	.. 860	....	3 seven-twelfth 240
.. 510	....	2 one-eighth 240	.. 870	....	3 five-eighth 240
.. 520	....	2 one-sixth 240	.. 880	....	3 two-third..... 240
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NOTE.—The pupil is recommended to pay particular attention to the foregoing table; its object is to facilitate the progress of those who wish to become expert calculators. The ingenious boy will see that the intermediate numbers can be found at once. The system is general, and will answer any number proposed. It will obviate the old Rule of Three and Practice systems; a hateful remembrance to those who have spent years over them, and terror to the tyro who has the dreary path before him.

EXAMPLES.

1.—What is the value of 160 stones of wheat, at 15d. per stone?

£15, the cost of 240.
One-third 5, the cost of 80, the deficiency.

£10, value of the proposed number.

2.—180 lbs. of beef, at 4½d. per lb.? Ans. £3 7s. 6d.
3.—200 lbs. of iron, at 2½d. per lb.? Ans. £1 17s. 6d.
4.—220 lbs. of sugar, at 6½d. per lb.? Ans. £5 19s. 2d.

PROBLEM 6.

The amount of any number greater than 240, so that the excess may be an aliquot part thereof.

RULE 6.—Write the pence as pounds, to which add such part of the same as the excess is of 240; the sum will be the amount.

EXAMPLES.

1.—What are 260 lbs. of tea worth, at 2s. 7½d. per lb.?

s. d.	£ s.	£ s. d.
2 7½	=31 10, to which add $\frac{1}{12}$	=34 2 6. Ans.

2.—What are 270 lbs. worth, at 13½d. per lb.? Ans. £15 3s. 9d.
3.—What are 280 lbs. worth, at 9½d. per lb.? Ans. £10 15s. 10d.
4.—What are 300 lbs. worth, at 11½d per lb.? Ans. £14 1s. 3d.
5.—What are 320 lbs. worth, at 8½d. per lb.? Ans. £11 13s. 4d.
6.—What are 360 lbs. worth, at 15½d. per lb.? Ans. £23 12s. 6d.
7.—What are 760 lbs. worth, at 18½d. per lb.? Ans. £58 11s. 8d.

NOTE.—This mode of calculation may be carried as far as you please. It is evident how any odd number may be computed; it is only requisite to find the amount of the even part, as is already shown, to which add the value of the prime part, and you have the total.

PROBLEM 7.

To calculate the amount of 240, or any number commensurate with 240, at pounds, shillings, pence, farthings, &c.

RULE 7.—First, find for 240, at so many pounds; then for the shillings, pence, farthings, fractions, &c. All these sums added, will give the amount required.

EXAMPLES.

1.—What is the value of 240 yards of broad cloth, at £1 7s. 7½d. per yard?

	£	s.	d.		£	s.	d.
*240 at	1	0	0	=	240	0	0
240 at	0	7	0	=	84	0	0
240 at	0	0	7	=	7	0	0
240 at	0	0	0½	=	0	10	0
				Ans.	£331	10	0

* *A new method* by addition for those not very conversant with multiplication.

EXPLANATION.

240 yards, at £1 will be £240; 240 yards, at seven shillings per yard, will be £84; 240 yards, at sevenpence per yard, will be £7; and 240 yards, at one halfpenny per yard, will be 10s.; making in all £331 10s.

2.—480 ozs. of gold, at £3 3s. 4½d. per ounce? Ans. £1521.
3.—960 cwt. of sugar, at £2 11s. 4d. per cwt.? Ans. £2464.
4.—1680 quarters of wheat, at £2 12s. 7d. per quarter? Ans. £4417.
5.—1920 quarters of barley, at £2 1s. 10d. per quarter? Ans. £4016.
6.—2400 yards of silk, at £3 1s. 7d. per yard? Ans. £7390.
7.—2880 ozs. of gold, at £4 15s. 10d. per ounce? Ans. £13800.

PROBLEM 8.

To compute a quantity in whole numbers, at any number of shillings per.

RULE 8.—Multiply the proposed number by half the price, when even, or by half the greatest even number contained therein; when odd, double the units's figure of the product for shillings, the remainder will be pounds; but for the odd part, add its amount, at a shilling per.

EXAMPLES.

1.—At 13s. per yard, what is the value of 83 yards?

83 yards.
½ of 13 = 6*

	49	16 at 12s.
83 yds. at 1s.	4	3 at 1s.
Ans.	£53	19

2.—270 yards, at 2s. per yard? Ans. £27.
3.—650 lbs. of tea, at 4s. per lb.? Ans. £130.
4.—640 yards of silk, at 6s. per yard? Ans. £192.
5.—572 yards of velvet, at 8s. per yard? Ans. £228 16s.
6.—673 yards, at 10s. per yard? Ans. £336 10s.
7.—763 yards, at 12s. per yard? Ans. £457 16s.

PROBLEM 9.

To calculate for any quantity when the price is shillings and pounds per.

RULE 9.—Double the given quantity, and multiply by half the price, or double the price, multiply by half the quantity, and you have the answer.

EXAMPLES.

1.—What will 26 yards come to, at 22s. per yard? 26 × 2 = £2 12s. × 11 = £28 12s. Ans.
2.—What will 16 yards come to, at 17s. a yard? Ans. £13 12s.

* REASON.—There are six twos contained in the greatest even number in 13, and when 83 is multiplied by 6, it produces 498 twos, the tenth of which will be pounds; but its tenth is the whole product of the unit's figure, which is multiplied by 2, produces shillings, being the same in effect as multiplying it by 20, and dividing the result by 10.

3.—What will 17 yards come to, at 18s. a yard? Ans. £15 6s.
4.—What will 28 yards come to, at 24s. a yard? Ans. £33 12.
5.—What will 150 tons come to, at £36 a ton? Ans. £5400.
6.—What will 35 acres of Wheat come to, at £32 per? Ans. £1120.
7.—What will 88 acres of Meadow bring, at £15 per? Ans. £1320.
8.—What is 350 tons of copper worth, at £140 per? Ans. £49,000.

EXERCISE VII.

CALCULATION OF WOOL.

As the weights of wool vary in different places, we think it will be useful to buyer and seller, to give the following table according to custom, with a few examples in each case, which will render the calculation familiar under any head:—

TABLE OF WEIGHTS.

General Weights.		*In some parts of England.*	
7 pounds...make... ...	1 clove.	15 pounds...make... ...	1 stone.
2 cloves, or 14 lbs. ...	1 stone.	2 stones, or 30 lbs. ...	1 tod.
2 stones, or 28 lbs. ...	1 tod.	8 tods, or 240 lbs. ...	1 pack.
6½ tods	1 wey.	In Ireland, 16 lbs... ...	1 stone.

In some places 14 lbs. make 1 stone.

PROBLEM 1.

Having the price per lb., to find the price per stone of 14 *lbs.*, 15 *lbs.*, *and* 16 *lbs.*

GENERAL RULE.—Call the pence which 1 lb. costs shillings, and you have the price of 12 lbs.; for a stone of 14 lbs. add the $\frac{1}{6}$; for a stone of 15 lbs. add the $\frac{1}{4}$; and for a stone of 16 lbs. add the $\frac{1}{3}$; and you have the answer.

Reason.—In either of the above cases, when you call the pence shillings you have the value of 12 lbs.; when you add the one-sixth, you have the amount of a stone of 14 lbs.; the one-fourth, the value of a stone of 15 lbs.; the one-third, the value of a stone of 16 lbs.

EXAMPLES OF 14 LBS.

1.—If 1 lb. of wool costs 17d., what is the cost of a stone of 14 lbs.?

d.	s.	d.
17 =	17	0
$\frac{1}{6}$	2	10

Ans. 19s. 10d.

2.—If 1 lb. cost 23½d., what will a stone come to? Ans. £1 7s. 5d.
3.—If 1 lb. cost 3s. 9½d., what is a stone worth? Ans. £2 13s. 1d.
4.—If 1 lb. cost 5s. 6½d., what will a stone come to? Ans. £3 17s. 3½d.

EXAMPLES OF 15 LBS.

1.—What will a stone of 15 lbs. come to, at 2s. 1¾d. per lb.?

s.	d.	£	s.	d.
2	1¾ =	1	5	9
One-fourth		0	6	5¼
	Ans.	£1	12	2¼

2.—If 1 lb. cost 13½d., what will a stone come to? Ans. 16s. 10½d.
3.—If a lb. cost 2s. 7½d., what will 7 stones come to? Ans. £13 13s. 5½d.
4.—If a lb. cost 1s. 9½d., what will 9 stones come to? Ans. £12 1s. 10½d.

EXAMPLES OF 16 LBS.

1.—What will a stone of 16 lbs. come to, at 2s. 5½d. per lb.?

s.	d.	£	s.	d.
2	5½ =	1	9	6
One-third		0	9	10
	Ans.	£1	19	4

2.—If 1 lb. cost 17¾d., what cost a stone? Ans. £1 3s. 8d.
3.—If 1 lb. cost 13½d., what cost a stone? Ans. 18s.
4.—If 1 lb. cost 16¼d., what cost a stone? Ans. £1 1s. 8d.

NOTE.—A pack of wool contains 240 lbs.; a pack of 15 lbs. to the stone contains 16 stones; a pack of 16 lbs. to the stone, 15 stones; so by either pack, stone, or lb., you have the result instantaneously, at any proposed price per pack, per stone, or per lb.

PROBLEM 2.

By having the price of a lb., to know the amount per pack.

RULE.—Call the pence which a pound costs pounds, the halfpenny ten shillings, and each farthing five shillings, and you have the amount per pack; then multiply by the number of packs, and you have the answer.

EXAMPLES.

1.—2 packs of wool, at 15¾d. per lb.? Ans. £31 10s.
2.—3 packs of wool, at 17¼d. per lb.? Ans. £51 15s.
3.—7 packs of wool, at 23¾d. per lb.? Ans. £166 5s.
4.—12 packs of wool, at 25¾d. per lb.? Ans. £309.

NOTE.—If you estimate a stone of 14 lbs. at a pound, it will be 1s. 5¼d.; a stone of 15 lbs., 1s. 4d.; and a stone of 16 lbs. 1s. 3d.

EXERCISE VIII.

THE CALCULATION OF WHEAT.

DENOMINATIONS OF

Corn Measures of Foreign Ports brought into Imperial Quarters.

	Quarters.		Quarters.
Alexandria.—Quillot or Kisloy 5-8th		Odessa.—100 Chetwerks	= 70
Berlin.—Last = 72 Scheffels =	13½	Pillare.—Last	= 12¾
Bremen.—Last = 40 Schs. =	9⅝	Rostock.—Last, 96 Scheffels	= 13
Dantzic.—Last = 56½ Schs. =	10½	Stettin.—Last, 72 Scheffels	= 13½
Denmark.—Barrel (21 B. =	10	St. Petersburg.—100 Chets.	= 70
...	= 10-21	Straulsund.—Last, 75 Schs.	= 14
Emoden.—Last ...	= 10½	Turkey.—100 Killows ...	= 12
Hamburg.—Last, Wheat and Rye = 30 Scheffels ...	= 11⅛	Wismar.—Last	= 13
Lubec.—Last, 96 Scheffels =	11 3/16	Wolgast.—Last, 75 Schs.	= 14
		Konigsberg.—Last, 50½ Schs. =	10½

PROBLEM 1.

Showing the price of a bushel, coomb, or quarter, to find the price of any number of bushels, coombs, or quarters, at any price per.

RULE.—Reduce the price of the bushel, coomb, or quarter, to pence, and multiply by as many shillings; multiply these by the number you have to ascertain for, according to rule 2nd, in page 73, and you have the amount.

EXAMPLES.

... bushels, at 5s. 4d. per bushel? Ans. £4 16s.
... bushels, at 4s. 10½d. per bushel? Ans. £6 6s. 9d.
... quarters, at £2 9s. 3d. per quarter? Ans. £56 12s. 9d.
... quarters, at £2 11s. 10d. per quarter? Ans. £80 6s. 10d.

NOTE.—A load of corn is 5 bushels, a cart-load 40 bushels, and a pint measure is supposed to contain 7922 wheat or barleycorns.

CALCULATION OF FLOUR.

PROBLEM 2.

... for any number of stones or bags, at any price per stone, per bag, etc.

... pence which a stone costs shillings, the shillings and ... bag costs pounds, then calculate on the general principles of 12 or 240, as the case may be.

EXAMPLES.

... flour, at 1s. 3d. per stone? Ans. 16s. 3d.
... flour, at 1s. 4d. per stone? Ans. 18s. 8d.
... or, at 27s. 9d. per bag? Ans. £27 15s.
... flour at 29s. 3d. per sack? Ans. £43 17s. 6d.
... flour at 32s. 3d. per sack? Ans. £96 15s.
... flour at 35s. 10d. per sack? Ans. £143 6s. 8d.

THE CALCULATION OF OATS AND BARLEY.

PROBLEM 3.

To calculate the amount of any number of bushels or quarters of oats, or barley, at any price per bushel or quarter.

RULE 3.—Bring the price of one into pence, which call shillings, and multiply by the number of quarters for the result.

EXAMPLES.

1.—30 quarters of barley, at 27s. 9d. per quarter? Ans. £41 12s. 6d.*
2.—23 quarters of barley, at 29s. 5d. per quarter? Ans. £33 16s. 7d.
3.—27 quarters of barley, at 31s. 9d. per quarter? Ans. £42 17s. 3d.
4.—37 quarters of barley, at 25s. 10d. per quarter? Ans. £47 15s. 10d.
5.—40 quarters of oats, at 42s. 6d. per quarter? Ans. £85.
6.—60 quarters of oats, at 52s. 9d. per quarter? Ans. £158 5s.
7.—80 quarters of wheat, at 54s. 6d. per quarter? Ans. £218.
8.—120 quarters of wheat, at 57s. 9d. per quarter? Ans. £346 10s.

EXERCISE IX.

THE CALCULATION OF LAND.

PROBLEM 1.

By having the price of a perch, to know the rate per acre.

RULE 1.—Write the price of a perch in pence as pounds, and from it deduct its one-third; the remainder will be the amount of the acres in pounds.

EXAMPLE.

1.—At 15½d. per perch, what is that per acre?
£15 15s., the amount of 240; $\frac{1}{3}$ = £10 10s. Ans.

PROBLEM 2.

By having the price per perch, to know the value per rood.

RULE 2.—Call the pence which the perch costs pounds, the one-sixth thereof will be the amount per rood.

EXAMPLE.

1.—At 6d per perch, what is that per rood? 6d. = £6, $\frac{1}{6}$ thereof = £1 Ans.

PROBLEM 3.

By having the price per acre, to know the amount per perch.

RULE 3.—To the price of the acre in pounds, add its half, the result will be the price of the perch in pence.

EXAMPLE.

1.—At £6 per acre, what is that a perch? $+\frac{1}{2}$, 6 = 3 + = 9d. Ans.

* It may assist the corn dealer to know, for small quantities,—that 4s. a bushel is 1½d. a quart; 6s., 2¼d.; 8s., 3d.; being for every 8d. a bushel, ¼d. per quart.

PROBLEM 4.

To reduce plantation to statute acres.

RULE 4.—Double the Irish acres, and from it take twice the double, keep two figures to the right; the one-hundred-and-twenty-first part of the remainder will be the statute acres.

EXAMPLE.

1.—In 484 Irish acres, how many English? $484 \times 2 = 968 \times 2 = 1936$ from $968 = 94864 + 121 = 784$ English acres. Ans.

PROBLEM 5.

To reduce English to Irish acres, or statute to plantation.

RULE 5.—To five times the English acres, add twelve times the same, and keep a figure to the left; to that sum add its one-forty-ninth; divide the result by 1000, and you have the acres in plantation measure.

EXAMPLE.

1.—In 784 English acres, how many plantation acres?

3920
47040

474320
$\div \frac{1}{49}$) 9680

$\div 1{,}000)484{\cdot}000 = 484$ acres, plantation. Ans.

DIMENSIONS IN YARDS WHICH MAKE AN ACRE.

1 yard	by 4840 long.	11 yards	by 440 long.
2 do.	by 2420 "	20 do.	by 242 "
4 do.	by 1210 "	22 do.	by 220 "
5 do.	by 968 "	40 do.	by 121 "
8 do.	by 605 "	44 do.	by 110 "
10 do.	by 484 "	55 do.	by 88 "

PROBLEM 6.

To find the value of a square yard of land, to an acre, at any price per square yard.

RULE 6.—Multiply the price per yard by 20, which call pounds, and add as many times 3s. 4d. as there are pence in the price of the yard, and you have the answer.

EXAMPLE.

1.—If 1 square yard is worth 2d., what is that per acre?

£	s.	d.	s.	d.	£	£	s.	d.
$2 \times 20 = 40$	3	$4 \times = 6$	$8 + 40 = 40$		6	8 Ans.		

PROBLEM 7.

To find the content of a piece of land in yards, feet, and inches.

RULE 7.—Reduce the yards and feet to feet; multiply the length by the width; divide the result by 9, and you have the content in yards and feet.

EXAMPLES.

1.—What is the content of a plot of ground, 6 yards 2 feet 6 inches long, by 4 yards 2 feet broad?

yds.	ft.	in.		ft.	in.
6	2	6	=	20	6
4	2	0	=	14	
			÷9)	287	0 feet.
				yds. 31	8 ft. Ans.

2.—What is the content of a plot of ground, 12 yards 1 foot, by 7 yards 2 feet broad? Ans. 94 yards 5 feet.

3.—If a garden be 45 yards 2 feet long, by 36½ broad, what does it measure in yards and feet? Ans. 1666 yards 7 feet 6 inches.

40 square perches = 2½ chains = 1 rood. 160 square perches = 10 chains = 4 roods = 1 acre. 4840 square yards = 1 acre.

LAND MEASURE BY THE SLIDE RULE.

RULE.—If the dimensions are given in chains, the guage point is 1 or 10 upon A; if in perches, 160; if in yards, 4840; the length upon B must be set opposite the breadth upon A, and you will have the answer in acres and parts upon B.

EXAMPLES.

1.—If a field be 20 chains 50 links long, and 4 chains 40 links broad, how many acres does it contain?

Direction.—Set 20·5 upon B to 1 upon A, and against 44 upon A are 9, the acres required on B.

2.—What is the content of a field 142 perches long, and 45 perches broad? Set 142 on B to 160 on A, and against 45 on A are 40·04 acres, the content on B.

3.—How many acres in a field 35·25 perches long, and 22·5 perches broad? Set 35·25 on B to 160 on A, and against 22·5 upon A are 4·95 acres on B.

EXERCISE X.

PROBLEM 1.

To reduce Irish miles to English, and English to Irish.

RULE 1.—Multiply the Irish miles by 2200, divide the product by 1760 and you will have the answer in English miles.

EXAMPLES.

1.—In 27 Irish miles, how many English?
$27 \times 2200 = 59400 \div 1760 = 33\frac{3}{4}$ miles, English. Ans.

2.—In 75 Irish miles, how many English? Ans. 93¾ miles.

The Reverse.

RULE 2.—Multiply the English miles by 1760, divide the product by 2200, and you have the number of miles Irish.

EXAMPLES.

4.—In 40 English miles how many Irish?

$40 \times 1760 = 70400 \div 2200 = 32$ miles, Irish. Ans.

5.—In 95 English miles, how many Irish? Ans. 76 miles.

EXERCISE XI.

NEW TABLE OF AVOIRDUPOIS WEIGHT, FROM ¼D. TO 3S. 6D. PER LB.; PER CWT.

℔ lb	℔ cwt.	℔ lb	℔ cwt.	℔ lb	℔ cwt.	℔ lb	℔ cwt.
d. £ s. d.		d. £ s. d.		d. £ s. d.		d. £ s. d.	
¼ is 0 2 4		6 is 2 16 0		11¾ is 5 9 8		20 is 9 6 8	
½ ... 0 4 8		6¼ ... 2 18 4		12 ... 5 12 0		21 ... 9 16 0	
¾ ... 0 7 0		6½ ... 3 0 8		12¼ ... 5 14 4		22 ...10 5 4	
1 ... 0 9 4		6¾ ... 3 3 0		12½ ... 5 16 8		23 ...10 14 8	
1¼ ... 0 11 8		7 ... 3 5 4		12¾ ... 5 19 0		24 ...11 4 0	
1½ ... 0 14 0		7¼ ... 3 7 8		13 ... 6 1 4		25 ...11 13 4	
1¾ ... 0 16 4		7½ ... 3 10 0		13¼ ... 6 3 8		26 ...12 2 8	
2 ... 0 18 8		7¾ ... 3 12 4		13½ ... 6 6 0		27 ...12 12 0	
2¼ ... 1 1 0		8 ... 3 14 8		13¾ ... 6 8 4		28 ...13 1 4	
2½ ... 1 3 4		8¼ ... 3 17 0		14 ... 6 10 8		29 ...13 10 8	
2¾ ... 1 5 8		8½ ... 3 19 4		14¼ ... 6 13 0		30 ...14 0 0	
3 ... 1 8 0		8¾ ... 4 1 8		14½ ... 6 15 4		31 ...14 9 4	
3¼ ... 1 10 4		9 ... 4 4 0		14¾ ... 6 17 8		32 ...14 18 8	
3½ ... 1 12 8		9¼ ... 4 6 4		15 ... 7 0 0		33 ...15 8 0	
3¾ ... 1 15 0		9½ ... 4 8 8		15½ ... 7 4 8		34 ...15 17 4	
4 ... 1 17 4		9¾ ... 4 11 0		16 ... 7 9 4		35 ...16 6 8	
4¼ ... 1 19 8		10 ... 4 13 0		16½ ... 7 14 0		36 ...16 16 0	
4½ ... 2 2 0		10¼ ... 4 15 4		17 ... 7 18 8		37 ...17 5 4	
4¾ ... 2 4 4		10½ ... 4 18 0		17½ ... 8 3 4		38 ...17 14 8	
5 ... 2 6 8		10¾ ... 5 0 4		18 ... 8 8 0		39 ...18 4 0	
5¼ ... 2 9 0		11 ... 5 2 8		18½ ... 8 12 8		40 ...18 13 4	
5½ ... 2 11 4		11¼ ... 5 5 0		19 ... 8 17 4		41 ...19 2 8	
5¾ ... 2 13 8		11½ ... 5 7 4		19½ ... 9 2 0		42 ...19 12 0	

PROBLEM 1.

The price of a drachm in farthings, to find the value of lbs.

RULE 1.—Multiply the price of a drachm in farthings, by sixteen, and that product by the number of lbs.; double the first figure for shillings, then divide by six; the quotient will be the answer in pounds, shillings, *and pence.*

EXAMPLES.

1.—At 3½d. the drachm, what cost 8 lbs.?
$13 \times 16 \times 8 = 166 \quad 8 \div 6 = £27\ 14s.\ 8d.$ Ans.
2.—At 4½d. the drachm, what cost 68 lbs.? Ans. £326 8s.

PROBLEM 2.

To find the value of a lb., the price per ounce being given.

RULE 2.—Divide the farthings in the price per ounce by three, for avoirdupois, and by four for troy. The answer will be shillings and pence in both cases.

Reason.—By taking the farthings as shillings, is multiplying by 48: now, $+48$ by $3 = 16$ oz. in a pound avoirdupois; $\div 48$ by $4 = 12$ lb. troy.

EXAMPLES.

1.—1 lb. avoirdupois, at 7½d. per ounce? Ans. 10s.
2.—1 lb. avoirdupois, at 10½d. per ounce? Ans. 14s. 4d.
3.—1 lb. troy, at 7½d. per ounce? Ans. 7s. 3d.
4.—1 lb. troy, at 11½d. per ounce? Ans. 11s. 9d.

PROBLEM 3.

THE REVERSE.

To find the value of an ounce, the price per lb. being given.

RULE 3.—For an ounce avoirdupois, take the shillings as farthings, and multiply by 3; if an ounce troy multiply by 4; and the result will be farthings in both cases.

Reason.—Taking the shillings as farthings, is equal to dividing by forty-eight, instead of sixteen; therefore, we multiply by three: for $16 \times 3 = 48$; and, in the case of troy weight, we multiply by four:—$12 \times 4 = 48$.

EXAMPLES.

1.—1 oz. avoirdupois, at 6s. per lb.? Ans. 4½d.
2.—1 oz. avoirdupois, at 9s. per lb.? Ans. 6¾d.
3.—1 oz. troy, at 6s. per lb.? Ans. 6d.
4.—1 oz. troy, at 9s. per lb.? Ans. 9d.

PROBLEM 4.

The value of any number of cwts. at pence per ounce.

RULE 4.—Multiply the pence per ounce by the cwts. and with the product considered as pence, take parts of 1792, (the number of ounces in 112 lbs.), the answer will be pounds sterling.

EXAMPLES.

1.—What will 6 cwts. come to at 5d per ounce?
$6 \times 5 = 30d. = 2s.\ 6d. = \frac{1}{8}$ of $1792 = £224$. Ans.
2.—What will 10 cwts. come to, at 4d. per oz.? Ans. £298 13s. 4d.
3.—What will 8 cwts. come to, at 3d. per oz.? Ans. £179 4s.
4.—What will 12 cwts. come to, at 4d per ounce? Ans. £358 8s.

PROBLEM 5.

Having the price per pound in pence, to find the amount per quarter.

RULE 5.—Multiply two shillings and fourpence by the price of a pound in pence, for the price of the quarter.

EXAMPLE.

1.—At 4d. per pound, what is that per quarter or 28 lbs.?

s. d.
2 4 × 4 = 9s. 4d. Ans.

PROBLEM 6.

The price of a lb. in pence being given, to find the value of a ton.

RULE 6.—Take the shillings in the price of a cwt. as pounds, and you have the answer in pounds, &c.

EXAMPLES.

1.—1 ton, at 3d. per lb.? Ans. £28.
2.—1 ton, at 4d. per lb.? Ans. £37 6s. 8d.
3.—1 ton, at 5d. per lb.? Ans. £46 13s. 4d.
4.—1 ton, at 7d. per lb.? Ans. £65 6s. 8d.

PROBLEM 7.

The price of a lb. in farthings being given, to find the value of a ton.

RULE 7.—Multiply the price of a lb. in farthings by seven, and divide by three for the answer in pounds.

Reason.—As the calculations are based either on the currency or the quantity, the reason of this rule will appear obvious. Divide 2240, the lbs. in a ton, by 7, multiply the quotient by 3, you have 960, the farthings in a pound. *The reverse.*—Multiply the lbs. in a ton by 3, divide the quotient by 7, and you have the same result.

EXAMPLES.

1.—If 1 lb. of iron cost 1¼d., what cost a ton?
1¼d. = 7 × 7 = 49 ÷ 3 = £16 16s. 8d. Ans.
2.—If 1 lb. of iron cost 2¼d., what cost a ton? Ans. £23 6s. 8d.
3.—If 1 lb. of iron cost 2¾d., what is it a ton? Ans. £25 13s. 4d.
4.—If 1 lb. cost 3¾d., what is a ton worth? Ans. £35.
5.—If 1 lb. of iron cost 4¼d., what is a ton worth? Ans. £39 13s. 4d.
6.—If 1 lb. of lead cost 4¾d., what is it per ton? Ans. £44 6s. 8d.

PROBLEM 8.

REVERSE OF THE FOREGOING RULE.

The price of a ton being given, to find the value of a lb.

RULE 8.—Multiply the price of a ton by three, and divide by seven: you have the answer in farthings per lb.

EXAMPLES.

1.—If 1 ton of iron cost £16 6s. 8d., what is that a lb.?

£ s. d.
16 6 8 × 3 = 49 ÷ 7 = 7 = 1¾d. Ans.

2.—If 1 ton cost £23 6s. 8d., what is it per lb.? Ans. 2⅛d.
3.—If 1 ton of iron cost £39 13s. 4d., what is it per lb.? Ans. 4¼d.
4.—If 1 ton cost £42, what is that per lb.? Ans. 4⅜d.
5.—If 1 ton cost £84, what is it per lb.? Ans. 9d.

PROBLEM 9.

To calculate the value af any number of tons, at pence per cwt.

RULE 9.—Multiply the pence per cwt. by the tons, and $\frac{1}{11\frac{1}{2}}$ of the product considered as pounds is the amount.

EXAMPLES.

1.—6 tons at 2d. per cwt.? $2 \times 6 = 12 \div 11\frac{1}{2} =$ £1. Ans.
2.—8 tons, at 3d per cwt.? $8 \times 3 = 24 \div 11\frac{1}{2} =$ £2. Ans.
3.—24 tons, at 7½d. per cwt.? Ans. £15.
4.—36 tons, at 13½d per cwt.? Ans. £40 10s.
5.—60 tons, at 19½d. per cwt.? Ans. £97 10s.

EXERCISE XII.

PROBLEM 1.

To calculate for cwts., qrs., lbs., and ¼lbs.; a shilling being the integer.

RULE 1.—Call the cwts. shillings; ¼ cwt., 9d.; ½ cwt., 6d.; ¼ cwt., 3d.; 14 lbs., 1½d.; 7lbs., 1½d.; 1 lb., $\frac{3}{28}$d.; ½ lb., $\frac{3}{56}$d.; ¼ lb., $\frac{3}{112}$d. Then multiply by the number of shillings; take parts for the odd pence, and you have the result.

EXAMPLES.

1.—What will the carriage of 17 cwts. 3 qrs. 21 lbs. come to, at 3s. per cwt.?

cwts. qrs. lbs. s. d. s. £ s. d.
17 3 21 = 17 11¼ × 3 = 2 13 9¾ Ans.

2.—15 cwts. 1 qr. 7 lbs., at 7s. per cwt.? Ans. £5 7s. 2½d.
3.—9 cwt. 3 qrs. 27 lbs., at 9s. per cwt.? Ans. £4 9s. $11\frac{1}{2}\frac{1}{8}$d.
4.—13 cwts. 3 qrs. 15 lbs., at 1s. 7d. per cwt.? Ans. £1 1s. $11\frac{8}{11}\frac{9}{2}$d.

PROBLEM 2.

To calculate for cwts. qrs. and lbs., at any price per cwt.; a pound being the integer.

RULE 2.—Call the cwts. pounds, five times the qrs. shillings, and two and the one-seventh times the lbs. pence; it will be the amount at a pound; then take parts for the shillings and pence.

EXAMPLES.

1.—What is 13 cwt. 2 qrs. 14 lbs. of pork worth, at £1 6s. 8d. per cwt.?

£	s.	d.	£	s.	d.	£	s.	d.
13	12	6	+ ½ =	4	10	10	+ =	18	3	4 Ans.

2.—27 cwts. 2 qrs., at £2 14s. 6d. per cwt.? Ans. £74 18s. 9d.

3.—33 cwts. 1 qr. 14 lbs. at £1 15s. per cwt.? Ans. £58 8s. 1½d.

4.—42 cwts. 1 qr. 20 lbs. at £1 13s. 4d. per cwt.? Ans. £70 14s. $3\frac{3}{7}$d.

5.—85 cwts. 1 qr. 10 lbs., at £2 17s. 6d. per cwt.? Ans. £245 7s. $0\frac{1}{2}\frac{3}{2}$d.

6.—19 cwts. 3 qrs. 19 lbs., at £4 15s. 6d. per cwt.? Ans. £95 2s. $3\frac{3}{1}\frac{7}{2}$d.

Reason.—Estimate the cwts. at a pound, and the qrs. and lbs. proportionably, then add all together, and you will have the answer.

PROBLEM 3.

APPLIED TO THE CARRIAGE OF RAILWAY GOODS, PER TON PER MILE.

To calculate for tons cwts. qrs. and lbs.; a pound being the integer.

RULE.—Call the tons, pounds; the cwts., shillings; ¾ cwt., 9d.; ½ cwt., 6d.; ¼ cwt., 3d.; 14 lb., 1½d.; 1 lb., $\frac{3}{2}\frac{}{8}$d. If more than a pound, multiply by the number of pounds, and take parts for the shillings and pence; if less than a pound, take parts for the shillings and pence out of the price at a pound.

EXAMPLES.

1.—7 tons 5 cwt. 3 qrs. 14 lbs. of goods, from London to Manchester, at 25s. 3d. per ton?

Tons.		£	s.	d.
7	=	7	0	0
5 cwt.	=		5	0
—¾	=		0	9
—14 lb.	=		0	1½
		7	5	$10\frac{1}{2}$ at £1.
5 is ¼		1	16	$5\frac{5}{8}$
—3	$\frac{1}{2}\frac{}{0}$	0	1	$9\frac{1}{1}\frac{4}{6}\frac{1}{0}$
		£9	4	$2\frac{1}{1}\frac{}{8}\frac{}{0}$ Ans.

2.—9 tons 9 cwt. 1 qr. 16 lbs. of goods, from York to Newcastle, at 17s. 6d. per ton? Ans. £8 5s. 1½d.

3.—37 tons 13 cwt. 2 qrs. 18 lbs. of goods, from Bristol to Liverpool, at £1 13s. 10d. per ton? Ans. £63 14s. $11\frac{3}{1}\frac{5}{1}\frac{}{2}$d.

4.—43 tons 1 cwt. 1 qr. 1 lb. of goods, from Paddington to Edinburgh, at £2 7s. 9d. per ton? Ans. £102 16s. $3\frac{1}{2}\frac{6}{2}\frac{3}{4}\frac{}{0}$d.

5.—84 tons 3 cwt. 3 qrs. 20 lbs. of goods, from Manchester to Aberdeen, at 52s. 9d. the ton? Ans. £222 1s. $4\frac{1}{2}\frac{9}{6}$d.

6.—45 tons 3 cwt. 3 qrs. 17 lbs. of goods were booked at Manchester for Edinburgh, at 1¼d. per ton per mile, (distance 272 miles); the Lancashire Company carried the goods 80 miles; York and Newcastle Company 76 miles; Newcastle and Berwick, 64 miles; Berwick and Edinburgh, 52 miles; what is the amount due to each company?

EXPLANATION.

45 tons 3 cwt. 3 qrs. 17 lbs., at 1½d. per ton per mile, is 4s. 8½d. (nearly).

		per mile.	£	s.	d.
Lancashire Company	80 miles, at	4s. 8½d. =	18	16	8
York and Newcastle do.	76 do. at	do. =	17	17	10
Newcastle and Berwick do.....	64 do. at	do. =	15	1	4
Berwick and Edinburgh do.....	52 do. at	do. =	12	4	10

NOTE.—The above will suffice to show the goods manager to calculate for any quantity of goods at any price per ton per mile; and will also be useful in booking offices, for ticket clerks, no matter how many companies may be concerned; it will likewise be of very great service to computers in the clearance house.

EXERCISE XIII.

NEW RULE FOR SPIRIT MERCHANTS, IN EITHER THE WHOLESALE OR RETAIL TRADE.

PROBLEM 1.

Having the price per gallon, to know the amount per hogshead.

RULE 1.—Take one-fifteenth of the farthings as pounds, from which deduct the cost of one gallon for the price per hogshead.

EXAMPLE.

1.—At 5s. 7¾d. per gallon, what is that per hogshead?*

5s. 7¾d. = 271 ÷ 15 = £18 1s. 4d.—5s. 7¾d. = £17 15s. 8¼d. Ans.

PROBLEM 2.

By knowing the price per glass, to know the cost per hogshead.

RULE 2.—Multiply four pounds four shillings by the price per glass in farthings for the cost per hogshead, and you have the answer in pounds and shillings.

EXAMPLE.

1.—At 1½d. per glass, what is that per hogshead?

£4 4s. × 6 = £25 4s. Ans.

PROBLEM 3.

By knowing the amount per hogshead, to find the price per glass.

RULE 3.—From the price of the hogshead in pounds, deduct its one-twenty-first part; the pounds that remain will be one-fourth farthings per glass; and for every five shillings (if any), count the one-sixteenth of a farthing.

* 63 gals. 1 hogshead.

EXAMPLE.

1.—At £25 4s. per hogshead, what is that per glass?

£ s. £ s. £ s. £ f.
÷21)25 4=1 4—25 4=24+4=6=1¼d. Ans.

PROBLEM 4.

By knowing the price of a gallon to find the price of a tun.

RULE 4.—To the price of a gallon in pence add one-twentieth of itself, and the sum will be the answer in pounds sterling.

EXAMPLES.

1.—If a gallon cost 6s. 3d., what will a tun* cost?

s. d. £ s. £ s. £ £ s.
6 3=75 0 ÷ $\frac{1}{20}$=3 15+15=18 15 Ans.

2.—If a gal. of rum cost 14s. 9d., what is that a tun? Ans. £185 17s.

THE REVERSE.

RULE 5.—From the price of the tun, subtract one-third of one-seventh of the cost, and the remainder will be the price of a gallon in pence.

EXAMPLE.

1.—If a tun cost £78 15s., what is that a gallon?

£ s. £ s. £ s. £ s. d. s. d.
78 15 ÷ 7 = 11 5 ÷ 3 = 3 15 — 78 15 = 75 = 6 3 Ans.

EXERCISE XIV.

NEW METHOD OF TROY WEIGHT FOR CHEMISTS AND SILVERSMITHS.

PROBLEM 1.

Knowing the price per grain, to find the cost per ounce.

RULE 1.—The cost per grain in halfpence will be the price per ounce in pounds; and, *vice versa*, the cost per ounce in pounds will be the value of the grain in halfpence.

Reason.—Four halfpence per grain will be £4 per ounce; and £4 per ounce will be four halfpence per grain.

PROBLEM 2.

Knowing the price per pennyweight, to find the amount of any number of pounds troy.

* 252 gals. make a tun. We beg to refer the reader to our Table on Liquids, as *given in page 51.*

RULE 2.—Multiply the pounds weight by the price per pennyweight, and you have the answer in pounds sterling.

EXAMPLE.

1.—At 4d. per pennyweight, what will 80 lbs. cost? $80 \times 4 = £320$ Ans.

PROBLEM 3.

Having the price of an ounce, to find the value of any number of pounds, ounces, pennyweights, and grains.

RULE 3.—Reduce the pounds to ounces, which increase by the given ounces; then call the ounces pounds, the pennyweights shillings, and half the grains pence, of which take such parts of the same as the price per ounce is of a pound.

EXAMPLE.

1.—At 5s. 6d. per ounce, what is the value of 10 lbs. 6 dwts. and 14 grs.?

lbs.	dwts.	grs.	£	s.	d.
10	6	14 = 120	6	7	
		5s. $\frac{1}{4}$)	30	1	$7\frac{1}{4}$
		6d. $\frac{1}{10}$)	3	0	$1\frac{3}{4}\frac{1}{0}$
			£33	1	$9\frac{1}{4}\frac{1}{0}$ Ans.

PROBLEM 4.

Having the price of an ounce, to know the value of any number of pounds.

RULE 4.—Multiply the pence per ounce by the number of lbs.; the product will be the answer in shillings.

EXAMPLE.

1.—At $4\frac{1}{2}$d. per ounce, what is the value of 7lbs.?

$4\frac{1}{2}$d. $\times$ 7 = £1 11s. 6d. Ans.

PROBLEM 5.

By having the price of a dwt. in farthings, to find what a pound cost.

RULE 5.—Take $\frac{1}{4}$ of the price of a dwt. in farthings; the quotient will be the answer in pounds.

EXAMPLES.

1.—If one dwt. of silver cost $3\frac{1}{2}$d. what will one lb. cost?

$\div$ 4) £13 = 3 5s. Ans.

2.—If 1 dwt. of silver cost 5d., what will 1 lb. cost? Ans. £5.

3.—If 1 dwt. of silver cost $4\frac{1}{4}$d., what will 1 lb. cost? Ans. £4 15s.

PROBLEM 6.

If the quantity be any number of pounds.

Rule 6.—Multiply the price of a dwt. in farthings by the given number of pounds; divide that product by 4 for the answer.

EXAMPLES.

1.—If 1 dwt. of silver cost 4¾d., what will 24 lbs. cost?
$24 \times 19 = 456 \div 4 = £114$ Ans.
2.—If 1 dwt. cost 6¼d., what will 36 lbs. come to? Ans. £225.
3.—If 1 dwt. cost 7½d., what will 48 lbs. cost? Ans. £360.

EXERCISE XV.

TO CALCULATE THE VALUE OF A THOUSAND.

PROBLEM 1.

By having the price of one, to know the value of a thousand.

Rule 1.—Call the pence pounds, multiply by four, to which add one-sixth for the answer.

Reason.—To multiply by four and one-sixth is evident; as four and one-sixth times 240 is 1000.

EXAMPLES.

1.—At 1¼d. per yard, what will 1000 yards cost?

£	s.	d.		£	s.	d.
1	15	0	× 4⅙ =	7	5	10 Ans.

2.—1000 yards of broad cloth, at 7s. 9d. per yard? Ans. £387 10s.
3.—1000 yards of linen, at 2s. 7½d. per yard? Ans. £131 5s.
4.—1000 gallons of rum, at 14s. 7d. per gallon? Ans. £729 3s. 4d.

PROBLEM 2.

To reverse the above, when the price of the thousand is an integral number of pounds.

Rule 2.—Multiply the integral by 4, subtract the result from the pounds, keeping two figures to the right of units place, the remainder will be the answer in farthings per yard. The two figures to the right will be centesimal parts of a farthing.

EXAMPLE.

1.—Suppose 1000 yards cost £25, what is that per yard?
£25 × 4 = 100 — 25 = 24,00 = 6d. Ans.

EXERCISE XVI.

WAGES.

TABLES OF SALARIES, ETC., FROM £1 TO £150 PER ANNUM, REDUCED TO SO MUCH PER MONTH, PER WEEK, PER DIEM.*

Y.	Pr. M.	Pr. W.	Pr. D.	Y.	Pr. M.	Pr. W.	Pr. D.	Y.	Pr. M.	Pr. W.	Pr. D.
£.	s. d.	s. d.	s. d.	£.	£. s. d.	s. d.	s. d.	£.	£. s. d.	£. s. d.	s. d.
1	1 8	0 4½	0 0⅔	11	0 18 4	4 2½	0 7⅓	30	2 10 0	0 11 6½	1 7½
2	3 4	0 9	0 1⅓	12	1 0 0	4 7½	0 8	40	3 6 8	0 15 4½	2 2½
3	5 0	1 1½	0 2	13	1 1 8	5 0	0 8½	50	4 3 4	0 19 2½	2 9
4	6 8	1 6	0 2⅔	14	1 3 4	5 4½	0 9½	60	5 0 0	1 3 0¾	3 3½
5	8 4	1 11	0 3½	15	1 5 0	5 9	0 10	70	5 16 8	1 6 11	3 10
6	10 0	2 3½	0 4	16	1 6 8	6 1½	0 10½	80	6 13 4	1 10 9½	4 4½
7	11 8	2 8	0 4½	17	1 8 4	6 6¾	0 11½	90	7 10 0	1 14 7½	4 11½
8	13 4	3 0½	0 5½	18	1 10 0	6 11	0 11½	100	8 6 8	1 18 5½	5 5½
9	15 0	3 5½	0 6	19	1 11 8	7 3½	1 0½	125	10 8 4	2 8 0½	6 10½
10	16 8	3 10	0 6½	20	1 13 4	7 8¼	1 1½	150	12 10 0	2 17 8¼	8 2⅔

PROBLEM 1.

Knowing the daily wages, to find the yearly salary.

RULE 1.—Call the pence pounds, to which add half thereof, and five days wages into one total for the answer.

EXAMPLE.

1.—At 15¾d. per day, what is the amount per annum?

£	s.	d.	
15	15	0	the amount of 240.
7	17	6	the amount of 120.
0	6	6¾	the wages of five days.
23	19	0¼	Ans.

PROBLEM 2.

Having the yearly salary, to know the daily wages.

RULE 2.—Double the annual salary in pounds, the one-third is the amount per day in pence: when the shillings are ten or more, to double the pounds add one; if less than ten, they are not to be taken into account. If, after the division of three, one should remain, allow a halfpenny; but if two remain, allow three farthings.

1.—If a servant's wages be £23 19s. 0¼d. yearly, what is that per day?

£23 × 2 = 47 ÷ by 3 = 15¾d. Ans.

PROBLEM 3.

To find what a number of pence per day will amount to in a year.

RULE 3.—Take three hundred and sixty-five as pence; that is one pound, ten shillings, and five pence: multiply this by the number of pence per day.

* The above table is calculated to the nearest amount that either employer or employed can demand.

Reason.—Because, £1 = 240d.; 10s. = 120d.; 4d. and 1d. = 5d. 240 + 120 + 4 + 1=365.

EXAMPLES.

1.—365 days, at 5d. per day? Ans. £7 12s. 1d.
2.—365 days, at 7d. per day? Ans. £10 12s. 11d.
3.—365 days, at 9d. per day? Ans. £13 13s. 9d.
4.—365 days, at 10d. per day? Ans. £15 4s. 2d.
5.—365 days, at 16d. per day? Ans. £24 6s. 8d.
6.—365 days, at 18¼d. per day? Ans. £27 15s. 1¼d.

PROBLEM 4.

To find what a number of pence, per day, will amount to in 311 *days, the number of working days in a year.*

RULE 4.—Multiply £1 5s. 11d. by the pence per day, and you have the yearly salary for 311 days.*

Reason.—Because 311 pence are equal to £1 5s. 11d., as stated.

1.—311 days, at 2d. per day? Ans. £2 11s. 10d.
2.—311 days, at 5d. per day? Ans. £6 9s. 7d.
3.—311 days, at 6d. per day? Ans. £7 15s. 6d.
4.—311 days, at 7d. per day? Ans. £9 1s. 7d.
5.—311 days, at 13d. per day? Ans. £16 16s. 11d.
6.—311 days, at 14d. per day? Ans. £18 2s. 10d.

NOTE.—Should there be farthings in the rate per day, add 6s. 5¼d. for every farthing, for 311 days. *Reason.*—Because 6s. 5¼d.=311 farthings= 6s. 5¼d.

PROBLEM 5.

To find what any number of shillings per week will amount to in a year.

RULE 5.—Add together two and a half times as many pounds, and twice as many shillings, as there are shillings per week.

EXPLANATION.

Thus,—6s. a week is £15 12s.; for twice six is £12; and half as many pounds is £3; and £12+£3 12s.=£15 12s.

Reason.—Because 52, the number of weeks in a year, is equal to 20 + 20 + 12 = 52.

EXAMPLES.

1.—1 year, at 5s. per week? Ans. £13.
2.—1 year, at 6s. per week? Ans. £15 12s.
3.—1 year, at 8s. per week? Ans. £20 16s.
4.—1 year, at 11s. per week? Ans. £28 12s.
5.—1 year, at 12s. per week? Ans. £31 4s.
6.—1 year, at 16s. per week? Ans. £41 12s.

* There are 311 working days in a year, omitting Sundays, Christmas Day, and Good Friday.

EXERCISE XVII.

CALCULATION OF INTEREST.

PROBLEM 1.

To calculate interest at five per cent. for days.

RULE 1.—Multiply the money or days by one-third of money or days; reject the unit's figure, and you have the answer in pence. Thus, the interest of £27 for 18 days: 27 × 6 = 16 (2 = 16d.; or 18 × 9 = 16) 2 = 16d. interest.

EXAMPLES.

1.—Interest on £24 for 7 days, at 5 per cent.? Ans. 5⅓d.

2.—Interest on £33 for 9 days, at 5 per cent.? Ans. 9¾d.

3.—Interest on £41 for 12 days, at 5 per cent.? Ans. 1s. 4⅓d.

4.—Interest on £75 for 6 days, at 5 per cent.? Ans. 1s. 3⅛d.

5.—Interst on £85 for 15 days, at 5 per cent.? Ans. 3s. $6\frac{5}{17}$d.

6.—Interest on £159 for 27 days, at 5 per cent.? Ans. 11s. $11\frac{1}{17}$d.

PROBLEM 2.

To find the interest for days at any rate per cent.

GENERAL RULE.—Multiply the principal by the days, and that sum by double the rate per cent. Cast off the units and tens; divide the figures to the left by 3; the quotient counts so many pence; deduct 1d. for every 6s.; the remainder will be the answer in pence.

EXAMPLES.

1.—What is the interest on £290 for 10 days, at 3 per cent.?

£ days. d. d. s. d. d. s. d.

290 × 10 = 2900 × 6 = 174,00 ÷ 3 = 58 = 4 10 — 1 = 4 9 Ans.

2.—What is the interest on £375 for 12 days, at 3½ per cent.?

£ days. d. d. s. d. d. s. d.

375 × 12 = 4500 × 7 = 315,00 + 3 = 105 = 8 9 — 1½ = 8s. 7½ Ans.

3.—Calculate the interest on £370 for 40 days, at 5 per ct.? Ans. £2 0s. 6⅔d.

4.—What is the interest on £280 for 60 days, at 6 per ct.? Ans. £2 15s. 2⅔d.

5.—Find the interest on £950 for 80 days, at 7 per ct.? Ans. £14 5s. 11⅓d.

A New Rule for finding Interest for days, at any rate per cent.

RULE 3.—Multiply the principal and days, divide the product by 1825, and you have the interest in shillings and pence for 1 per cent., then multiply by the rate per cent. for the answer.

EXAMPLES.

1.—Find the interest on £650 for 15 days, at 4 per cent.?

£ days. s. d. £ s. d.

650 × 15 = 9750 ÷ 1825 = 5 $4\frac{8}{73}$ × 4 = 1 1 4⅓ Ans.

2.—What is the interest on £280 for 60 days, at 6 per cent.?

£ days. s. d. £ s. d.

280 × 60 = 16800 ÷ 1825 = 9 $2\frac{3}{73}$ × 6 = 2 15 2¼ Ans.

NOTE.—1825 is a universal divisor for 1 per cent. *Reason.*—If you multiply 365 by 100 = 365,00 ÷ 20 = 1825, which will be the divisor in all cases.

PROBLEM 3.

To calculate interest at five per cent. for months.

RULE 4.—Write the pounds as pence, and multiply by the number of months for the answer in pence.

EXAMPLES.

1.—Interest on £4 for two months, at 5 per cent.? Ans. 8d.
2.—Interest on £7 for three months, at 5 per cent.? Ans. 1s. 9d.
3.—Interest on £9 10s. for three months, at 5 per cent.? Ans. 2s. 4½d.
4.—Interest on £72 for nine months, at 5 per cent.? Ans. £2 14s.
5.—Interest on £96 5s. for three months, at 5 per cent.? Ans. £1 4s. 0¾d.
6.—Interest on £144 15s. for nine months, at 5 per cent.? Ans. £5 8s. 6¾d.

PROBLEM 4.

To calculate interest upon any sum at five per cent. per annum.

GENERAL RULE.—Reckon a shilling for every pound, and threepence for every five shillings.

EXAMPLES.

1.—Interest on £75, at 5 per cent.? Ans. £3 15s.
2.—Interest on £110, at 5 per cent.? Ans. £5 10s.
3.—Interest on £98, at 5 per cent.? Ans. £4 18s.
4.—Interest on £26 5s., at 5 per cent.? Ans. £1 6s. 3d.
5.—Interest on £47 10s., at 5 per cent.? Ans. £2 7s. 6d.
6.—Interest on £69 15s., at 5 per cent.? Ans. £3 9s. 9d.

PROBLEM 5.

To find the interest on any sum for months at three per cent.

RULE 6.—Multiply $\frac{1}{20}$ of the principal by the months, and you have the answer in shillings.

EXAMPLES.

1.—What is the interest on £220 for 11 months, at 3 per cent.?
$+\frac{1}{20}$) 220 = 11 × 11 = 121s., or £6 1s. Ans.
2.—What is the interest on £200 for 10 months, at 3 per cent.? Ans. £5.
3.—What is the interest on £180 for 9 months, at 3 per cent.? Ans. £4 1s.
4.—What is the interest on £160 for 8 months, at 3 per cent.? Ans. £3 4s.
5.—What is the interest on £140 for 7 months, at 3 per cent.? Ans. £2 9s.
6.—What is the interest on £245 13s. 8d. for 1 month, at 3 per cent.? Ans. £12 5s. 8d.

NOTE.—The above will be found very useful in Savings Banks.

PROBLEM 6.

To calculate interest for months, at six per cent.

RULE 7.—Multiply the pounds and months; cut off the unit figure of the product, and the remainder will be the interest in shillings. The figure cut off is tenths of a shilling. Thus the interest of £9 at 6 per cent., for 5 months, is $9 \times 5 = 4(5 = 4\frac{5}{10}$s. $= 4$s. 6d.

EXAMPLES.

1.—Interest on £7 for three months, at 6 per cent.? Ans. 2s. 1½d.
2.—Interest on £12 for four months, at 6 per cent.? Ans. 4s. 9½d.
3.—Interest on £270 for seven months, at 6 per cent.? Ans. £9 9s.
4.—Interest on £350 for eight months, at 6 per cent.? Ans. £14.
5.—Interest on £90 for eight months, at 6 per cent.? Ans. £3 12s.
6.—Interest on £380 for nine months, at 6 per cent.? Ans. £17 2s.

PROBLEM 7.

To find the interest for months at any rate per cent.

GENERAL RULE.—Multiply the principal by the number of months, and that by twice the rate; cut off the unit's figure, which will be so many tenths of 1d.; the figure to the left will be so many pence.

EXAMPLES.

1.—What is the interest on £36 for 3 months, at 2½ per cent.?
£36 × 3 = 108 × 5 = 54d. = 4s. 6d. Ans.
2.—Find the interest on £87 for 5 months, at 3¾ per cent.?
£87 × 5 = 435 × 7½ = 326,2d. = £1 7s. 2½d. Ans.
3.—Interest on £150 for 7 months, at 1¼ per cent.? Ans. £1 1s. 10½d.
4.—Interest on £270 for 9 months, at 3¾ per cent.? Ans. £7 11s. 10½d.
5.—Interest on £784 for 10 months, at 4 per cent.? Ans. £26 2s. 8d.
6.—Interest on £459, at 5 per cent., for 11 months? Ans. £25 3s. 3d.
7.—Interest on £160 for 5 months, at 1 per cent.? Ans. 8s. 4d.
8.—Interest on £120 for 9 months, at ½ per cent.? Ans. 9s.
9.—Interest on £320 for 4 months, at ⅛ per cent.? Ans. 2s. 8d.
10.—Interest on £184 for 5 months, at ¼ per cent.? Ans. 3s. 10d.
11.—Interest on £82 for 8 months, at 1¾ per cent.? Ans. 19s. 1⅗d.
12.—Interest on £110 for 9 months, at 5 per cent.? Ans. £1 2s. 6d.
13.—Interest on £116 for 8 months, at 5½ per cent.? Ans. £4 5s. 0½d.
14.—Interest on £140 for one month, at 4 per cent.? Ans. 9s. 4d.
15.—Interest on £90 for ten months, at 4½ per cent.? Ans. £3 7s. 6d.
16.—Interest on £83 for three months, at 3 per cent.? Ans. 12s. 5½d.
17.—Interest on £150 for two months, at 4¼ per cent.? Ans. £1 1s. 3d.
18.—Interest on £50 for eight months, at 1½ per cent.? Ans. 10s.

PROBLEM 8.

To find the interest on any sum at any rate per cent.

RULE 9.—An infallible rule for finding the Interest of any sum, for any number of years, at any rate per cent.—Multiply the principal by the time and rate, and divide the result by 100, and you have the answer.

EXAMPLES.

1.—What is the interest on £991 3s. 3d. for 3½ years, at 3 per cent.?

× 3½ by 3 = 10 × £991 3s. 3d.
10
÷ 1,00) 99,11 12 6
20
2,32
12
300/100 £99 2s. 3 9/10 Ans.

2.—What is the interest on £765 12s. 7d. for 4 years, at 2½ per cent. per annum? Ans. £76 11s. 3 1/10 d.

3.—What is the interest on £78 12s. 10d. for 12½ years, at 1 per cent. per annum? Ans. £9 16s. 7¼d.

4.—Find the interest on £888 8s. 8d. for 3¾ years, at 3½ per cent. per annum? £124 18s. 8⅛d.

5.—What is the interest of £325 7s. 6d. for 3⅓ years, at 6 per cent. per annum? Ans. £65 1s. 6d.

PROBLEM 9.

A new method for finding Interest at any rate per cent. per annum.

GENERAL RULE.—1st. Double the unit's figure for pence and so many fifths of a penny. 2nd. Double the tens for shillings, the remaining figures are pounds, and you have the interest at 1 per cent., then multiply for any rate required.

EXAMPLES.

1.—What is the interest on £27 at 2½ per cent.?

27 × 2 = 5s. 4⅖d. × 2½ = 13s. 6d. Ans.

2.—Find the interest on £75 at 3 per cent.?

75 × 2 = 15s. × 3 = £2 5s. Ans.

3.—Tell the interest on £49 at 3¼ per cent.? Ans. £1 11s. 10⅘d.

4.—Calculate the interest on £84 at 4 per cent.? Ans. £3 7s. 2⅖d.

5.—Find the interest on £75 at 3 per cent.? Ans. £2 16s. 3d.

Scale of rates on a pound for 12 months, from 1 to 10 per cent.

Per cent.	s. d.	Per cent.	s. d.
1 .. is	2⅖	6	1 2⅖
2	4⅘	7	1 4⅘
3	7⅕	8	1 7⅕
4	9⅗	9	1 9⅗
5	1 0	10	2 0

NEW TABLE OF DISCOUNT AT THE RATES COMMONLY USED BY COMMERCIAL MEN.

Per ct.	In 1s.	In 3s.	In 5s.	In 7s.	In 10s.	In 13s.	In 15s.	In 17s.	In 19s.	In £1.
	D.	s. D.	s. D.	s. D.	s. D.	s. D.	s. D.	s. D.	s. D.	s. D.
2½	¼	0 1	0 1½	0 2	0 3	0 4	0 4½	0 5	0 5¾	0 6
3	¼	0 1	0 1⅝	0 2⅛	0 3⅛	0 4⅛	0 5¼	0 6	0 6¾	0 7
4	⅓	0 1⅓	0 2¼	0 3¼	0 4⅜	0 6¼	0 7	0 8	0 9	0 9½
5	⅓	0 1⅔	0 3	0 4⅓	0 6	0 7¼	0 9	0 10½	0 11½	1 0
7½	1	0 2¼	0 4½	0 6¼	0 9	0 11¼	1 1½	1 3¼	1 5	1 0
10	1¼	0 3⅓	0 6	0 8⅓	1 0	1 3⅓	1 6	1 8⅓	1 10⅔	2 0
12½	1½	0 4½	0 7½	0 10½	1 3	1 7½	1 10½	2 1½	2 4½	2 6
15	1¾	0 5¼	0 9	1 0¼	1 6	1 11¼	2 3	2 6½	2 10	3 0
25	3	0 9	1 3	1 9	2 6	3 3	3 9	4 3	4 9	5 0
33⅓	4	1 0	1 8	2 4	3 4	4 4	5 0	5 8	6 4	6 8

Per ct.	In £1.	In £10.	In £20.	In £30.	In £40.	In £50.
	s. D.	s. D.	£ s. D.	£ s. D.	£ s. D.	£ s. D.
1/10	0 ¼	0 2½	0 0 4¾	0 0 7½	0 0 9½	0 1 0
⅛	0 ¼	0 3	0 0 6	0 0 9	0 1 0	0 1 3
¼	0 ½	0 6	0 1 0	0 1 6	0 2 0	0 2 6
⅜	0 ¾	0 9	0 1 6	0 2 3	0 3 0	0 3 9
½	0 1	1 0	0 2 0	0 3 0	0 4 0	0 5 0
⅝	0 1½	1 3	0 2 6	0 3 9	0 5 0	0 6 3
¾	0 1¾	1 6	0 3 0	0 4 6	0 6 0	0 7 6
⅞	0 2	1 9	0 3 6	0 5 3	0 7 0	0 8 9
1	0 2¼	2 0	0 4 0	0 6 0	0 8 0	0 10 0
1⅛	0 2½	2 3	0 4 6	0 6 9	0 9 0	0 11 3
1¼	0 3	2 6	0 5 0	0 7 6	0 10 0	0 12 6
1⅜	0 3¼	2 9	0 5 6	0 8 3	0 11 0	0 13 9
1½	0 3½	3 0	0 6 0	0 9 0	0 12 0	0 15 0
1⅝	0 3¾	3 3	0 6 6	0 9 9	0 13 0	0 16 3
1¾	0 4	3 6	0 7 0	0 10 6	0 14 0	0 17 6
2	0 4½	4 0	0 8 0	0 12 0	0 16 0	1 0 0
2¼	0 5¼	4 6	0 9 0	0 13 6	0 18 0	1 2 6
2½	0 6	5 0	0 10 0	0 15 0	1 0 0	1 5 0
2¾	0 6½	5 6	0 11 0	0 16 6	1 2 0	1 7 6
3	0 7	6 0	0 12 0	0 18 0	1 4 0	1 10 0
3½	0 7¾	6 6	0 13 0	0 19 6	1 6 0	1 12 6
3¾	0 9	7 6	0 15 0	1 2 6	1 10 0	1 17 6
4	0 9½	8 0	0 16 0	1 4 0	1 12 0	2 0 0
4½	0 10	8 6	0 17 0	1 5 6	1 14 0	2 2 6
4⅝	0 10¾	9 0	0 18 0	1 7 0	1 16 0	2 5 0
4¾	0 11¼	9 6	0 19 0	1 8 6	1 18 0	2 7 6
5	1 0	10 0	1 0 0	1 10 0	2 0 0	2 10 0
7½	1 6	15 0	1 10 0	2 5 0	3 0 0	3 15 0

NOTE.—By referring to the first Table for Commission on 1s., 5s., 10s.,

15s., or a pound, you can multiply by any other number of shillings or pounds you require; also, in the second Table, multiply by any number of pounds you want, you have the commission.

A NEW METHOD FOR COMPUTING COMMISSION,

Brokerage, Premium of Insurance, Interest, Discount on Invoices or per centage, allowance for ready money, etc.

RULE 1.—Multiply the given number of pounds by twice the rate per cent. Take the unit for pence and so many 5ths of a penny, and the remaining figures are the shillings.

1.—What is the commission on £83 at 2 per cent.? £83 × 4 = 33s. $2\frac{2}{5}$d. Ans.

2.—What is the commission on £58, at $6\frac{1}{4}$ per cent.?*

£58 × $12\frac{1}{2}$ = 72,5 + 1 = 6, or 72s. 6d. Ans.

3.—What is the commission on £125, at $3\frac{3}{4}$ per cent.?

£125 × $6\frac{3}{4}$ = 84,3 + 1 = 84s. $4\frac{1}{2}$d. Ans.

EXERCISE XVIII.

ARREARS AND ANNUITIES AT SIMPLE INTEREST.

PROBLEM 1.

The annuity, rate per cent., and time given, to find the amount.

RULE 1.—Multiply the rent or annuity by the time; again multiply time and rate, less 1; take half this sum, and take such part or parts as it is of 100, which divide into the product, adding both sums for the answer.

EXAMPLES.

1.—If the yearly rent of £45 remain unpaid for five years, at 5 per cent. per annum, what will it amount to?

45 × 5 = £225. 4 × 5 = 20 ÷ $\frac{1}{2}$ = $\frac{1}{10}$ ÷ £225 = £22 10s. + £225 = £247 10s. Ans.

2.—What will an annuity of £120 amount to, suppose it to be forborne for six years, at 5 per cent. per annum? Ans. £810.

3.—What will a pension of £75 amount to, if it be foreborne for twenty-one years, at 2 per cent. per annum? Ans. £1890.

PROBLEM 2.

The amount, rate per cent., and time given, to find the annuity.

RULE 2.—Divide the amount by the time, next multiply time and rate, less 1; take half that product, and see what part it is of 100, then add

* When the unit is more than 4, and when the shillings produced by the multiplication are more than 5, then add one penny to the result for each unit and fraction.

the numerator and denominator for a devisor, which divide into the sum, subtracting the quotient from the sum, and you have the annuity.

EXAMPLES.

1.—If a yearly rent, foreborne five years at 5 per cent. per annum, amount to £347 10s., how much was the annuity?

£247 10s. ÷ 5 = £49 10s. 5 × 4 = 20 ÷ $\frac{1}{2}$ = $\frac{1}{20}$; 1 + 10 = 11 and 11 ÷ £49 10s. = £4 10s. − = £45 annuity. Ans.

2.—If an annuity amount to £810 in six years, at 5 per cent. per annum, what was the annuity? Ans. £120.

3.—If a yearly pension amounted to £3,300 in eleven years, at 4 per cent. per annum, how much was the pension? Ans. £250.

EXERCISE XIX.

THE PURCHASING OF PROPERTY AND FREEHOLD ESTATES.

PROBLEM 1.

To find what rate per cent. money may be laid out in purchasing property.

RULE 1.—Divide 100 by the number of years' purchase, and you have the per centage.

EXAMPLES.

1.—If you purchase an estate worth £100 a year, and give thirteen years' purchase, what per cent. have you for your outlay? 100 ÷ 13 = £7 13s. $10\frac{2}{13}$d. per cent. Ans.

2.—Gave fourteen years' purchase for a rental of £170 a year; what per cent. have I for my money? Ans. £7 2s. $10\frac{2}{7}$d. per cent.

3.—If you give twenty-one years' purchase for a property, which brings in £190 per annum, what per cent. have you for your money? Ans. £4 15s. $2\frac{2}{7}$d. per cent.

PROBLEM 2.

The purchase money and rate per cent. given, to find the yearly rent.

RULE 2.—Divide the purchase money by that part which the rate is of 100, and you have the yearly rent.

EXAMPLES.

1.—If an estate be sold for £11,000, what must be the yearly rent to allow the buyer 5 per cent. per annum? 5 = ÷ $\frac{1}{20}$) £11,000 = £550 Ans.

2.—If a freehold be sold for £30,000, what must be the yearly rent to allow the purchaser 4 per cent. per annum? Ans. £1200.

PROBLEM 3.

The yearly rent and purchase money given, to find the rate per cent.

RULE 3.—Divide the purchase money by the yearly rent; 100 divided by the quotient will give the rate per cent.

EXAMPLES.

1.—If an estate of £550 be bought for £11,000, at what rate per cent. is the money laid out?

£
550) 11000

20 ÷ 100 = 5 per cent. Ans.

2.—If an estate of £1200 a year is bought for £30,000, at what rate per cent. is the money laid out? Ans. 4 per cent.

EXERCISE XX.

PROFIT AND LOSS.—NEW RULES.

PROBLEM 1.

Given the whole profit and rate per cent., to find the prime cost.

RULE 1.—Multiply the gain by that part which the given rate is of 100, and you have the prime cost or purchase money.

EXAMPLES.

1.—If by selling goods at 2½ per cent. profit I clear £13, what did the goods cost me?

£13
$2\frac{1}{2} = \frac{1}{40}$ of 100 × 40

Ans. £520

2.—If by selling tea at 5 per cent. profit I clear £19 19s., what did the tea cost me? £399. Ans.

3.—If by selling sheep at 12½ per cent. profit I clear £27, how much have I paid for the sheep? 27 × 8 = £216. Ans.

PROBLEM 2.

The first cost and selling price being given, to find the gain per cent.

RULE 2.—Subtract the first cost from the selling price: divide the cost by their difference, and 100 divided by the quotient will give the rate per cent. gain.

EXAMPLES.

1.—If I buy a horse for £15, and sell it for £17 10s. what is the gain per cent.?

£17 10s.
15 0

£2 10

£2 10 in 15 = 6 in 100 = 16⅔ per cent. Ans.

2.—Bought a yard of broadcloth at 6s., and sold it for 7s.; what was the gain per cent.? Ans. 16⅔ per cent.

3.—If I buy tea at 6s. per lb., and sell it at 6s. 8d., what will I gain per cent.? Ans. 11⅑ per cent.

4.—Bought linen at 12d. per yard, and sold it at 13½d.; what is the gain per cent.? Ans. 12½ per cent.

5.—If I buy broadcloth at 13s. 4d. per yard, and sell it at 20s., what do I gain per cent.? Ans. 50 per cent.

6.—Bought tobacco at 3s. per lb., and sold it at 3s. 4d.; what is the gain per cent.? Ans. 11⅑ per cent.

PROBLEM 3.

The first cost and rate per cent. given to find the selling price.

RULE 3.—Divide the prime cost by that part which the rate is of 100; add the quotient to the first cost, and you have the selling price.

EXAMPLES.

1.—Bought a quantity of cotton for £12345; how must I sell it to gain 5 per cent.?

£
5 = ÷ 1/20) 12345
617 5

Ans. £12962 5s.

2.—Bought a yard of cloth for 6s.; how must I sell it to gain 16⅔ per cent.? Ans. 7s.

3.—Bought a quantity of sugar for £22 13s. 6d.; how must I sell it to gain 9 1/11 per cent.? Ans. £24 14s. 8 8/11 d. per cent.

4.—Bought a horse for £14; how must I sell it to gain 14⅔ per cent.? Ans. £16.

5.—Bought tobacco at 3s. per lb.; how must I sell it per lb. to gain 11⅑ per cent.? Ans. 3s. 4d.

PROBLEM 4.

The cost of the whole, with the retail price given, to find the profit or loss.

RULE 4.—Find the first cost from the retail price. If the selling price be

more than the prime cost, you have gained; but if less, you have lost so much.

EXAMPLES.

1.—Bought 20 yards of cloth for £19, and sold it at 18s. 4d. per yard.; did I gain or lose? Ans. 13s. 4d. lost.

2.—Bought 60 lbs. of tea for £22, which I retailed at 7s. 8d. per lb.; tell me the gain or loss? Ans. £1 gain.

3.—Bought 40 yards of cloth for £33, and sold it for 13s. per yard; tell me the gain or loss? Ans. £1 gain.

4.—Bought 140 gallons of gin for £63; I retailed the same at 9s. 6d. per gallon; tell me the gain or loss? Ans. £3 10s. gain.

5.—Bought 220 gallons of rum for £176; sold it immediately at 16s. per gallon; how much have I gained or lost?

s.	£	
220 at 16 =	176	sold.
——	176	bought. Neither gain nor loss.

6.—If by selling goods for £40 I gained $\frac{1}{4}$ of what they cost, how much did they cost me? Ans. £32.

7.—Sold goods for £25 and lost $\frac{1}{5}$ of what they cost me; how much did I pay for them? Ans. £30.

8.—Sold a quantity of broadcloth for £72, and gained $\frac{2}{7}$ of what it cost me; how much did I pay for it? Ans. £45.

EXERCISE XXI.

SUPPOSITION.

RULE.—As the result from the supposition is to the true result, so is the supposed number to the number required.

EXAMPLES.

1.—A man being asked how many shillings he had in his pocket, said, "If I had as many, half as many, and a quarter as many more, I would have 66s.;" how many had he? Suppose 4

4
2
1

÷11)66=6 × 4=24s. Ans.

2.—A person being asked how many pence he had, said, "If the third, fourth, and sixth of the number were added, they would make 63;" how many had he? Ans. 84d.

3.—Joseph asked James how many marbles he had? James said, "If I had as many, twice as many, and three times as many more, I should have *42;*" how many marbles had James? Ans. 6.

4.—Three wheels are to make 180 revolutions, the second to make 2 for the first 1, and the third to make 3 for the second 1; how many revolutions did each make? Suppose 1 + 9) 180 = 20 × 1 = 20 first.

2 — 20 × 2 = 40 second.

6 20 × 6 = 120 third.

Ans. 9

EXERCISE XXII.

NEW METHOD OF EXTRACTING THE SQUARE ROOT.

PROBLEM 1.

A new and expeditious method for extracting the square root. By it any root may be extracted, by quadrate, sursolid, &c., &c.

RULE.—Divide the given number whose root is to be extracted, by some digit involved in the same power; divide the quotient by the latter divisor by a like power of some other digit; continue the division till one or some small insignificant remainder occurs, and choose, if possible, such divisors as the dividend will contain without a remainder. Then, the required root taken off, the different divisors will be always rational, and these multiplied into each other, will be the true root if there be no remainder; but, if a remainder occurs, place the root thus found drawn into the index of the power beneath the excess of the given number, whose root is to be extracted above the product of the respective divisors, which increase must be affixed to the rational root for the root of the required number, which will be found sufficiently correct for any practical purpose.

EXAMPLES.

1.—What is the square root of 144?

First, divide 144 by 16, and divide the quotient by nine; then 16 and 9 are the divisors, whose roots are 4 and 3; the product of these will be 12, which is the root required.

If the number be irrational, as seven hundred and twenty, and its root required, divide by nine, then by sixteen, and next by four; then nine, sixteen, and four, are the divisors, and one hundred and forty-four the remainder. Hence the root of the rational part of seven hundred and twenty-four, and its double placed beneath the one hundred and forty-four. This fraction affixed to twenty-four, gives twenty-seven for the root, nearly.

2.—What is the square root of 3969? Ans. 63.

3.—Required the square root of 729? Ans. 27.

4.—What is the square root of 43264? Ans. 208.

5.—What is the square root of 50865424? Ans. 7132.

6.—What is the square root of ·00032754? Ans. ·01809+.
7.—What is the square root of 2·2710957? Ans. 1·50701+.

PROOF.—Square the root found, and to the product add the remainder, if any. If the work be right, the sum will be the same as the number to be extracted.

Squares:—	1,	4,	9,	16,	25,	36,	49,	64,	81.
Roots:—	1,	2,	3,	4,	5,	6,	7,	8,	9.

To square a number ending in 5.

RULE.—Multiply the number to the left hand of 5 by one greater; then annex 25 to the right, which will be the square of the number proposed.

EXAMPLES.

1.—Square 75.— × 7 by 8=56. Affix 25 to the right, thus 5625, which is the square of 75.
2.—Square 95.— × 9 by 10=90. Annex 25 and it will be thus 9025, the square of 90.

To square a number that ends with one.

RULE.—To 10 times the square of the number, without the 1, add double that number; annex the sum, with 1, and you have the square of the number.

EXAMPLES.

1.—Square 41.—10 times the square of 4 is 160; 4 × 2 = 8; added to it make 168; to which prefix 1=1681, the square required.
2.—Square 91.—the 9 × 9 × 10=810; then add 9 × 2 = 18, make 828; to which annex 1, is 8281, the square.

CUBE ROOT.

RULE.—Point out the number given in periods of three figures each; find the nearest cube to be the first period, then subtract, and put the root in the quotient: three times the square of the root will be the true divisor for the next. Multiply the figures found by three; join the product to the next root; multiply this number by the new root figure; place that product two figures to the right under the trial divisor, to which add the same, and you have the true divisor.

PROOF.—Cube the root, and to the product add the remainder, and the sum will be the same as the number to be extracted.

Cubes:—	1,	8,	27,	64,	125,	216,	343,	512,	729.
Roots:—	1,	2,	3,	4,	5,	6,	7,	8,	9.

EXAMPLES.

1.—What is the cube root of 373248?

373248(72
343

$7^2 = 49 \times 3 = 147)302,48$

7^2 or $49 \times 300 \times 2 = 29400$
$7 \times 30 \times 2^2$ or $4 = 840$
2^3 or $2 \times 2 \times 2 = 8$

302,48

Proof.
72
72
5184
72
373248 cube.

2.—What is the cube root of 48625125? Ans. 365.
3.—What is the cube root of 84604519? Ans. 439.
4.—What is the cube root of 259694072? Ans. 638.

EXERCISE XXIII.

THE SLIDING RULE.

The sliding rule is a kind of logarithmic table and is so constructed as to obtain the solution of arithmetical questions in either multiplication, division, or extraction of the roots of numbers. It is formed of two pieces of box-wood, each 12 inches in length, joined together by a brass folding joint. In one of the pieces there is a brass slider. The rules are commonly marked with A on the rule, B and C on the slider, and D on the girt or square line. Let the learner observe whatever value is given to the first 1 from the left, the numbers following, viz.:—2, 3, 4, 5, &c., will represent twice, thrice, four times, &c., that value. If one is reckoned one or unity, the rest will count 2, 3, 4, &c.; but if the one is reckoned ten, then 2, 3, 4, will count 20, 30, 40, &c. Should the first one be called 100, then 2, 3, 4, &c., will count 200, 300, 400, &c. The value of the one in the middle of the line is always ten times that of the first one; the value of the second 2 is ten times that of the first 2; so that if the value of the first 1 be 10, that of the second 1 will be 100: the first two will be 20, and the second 2 will be 200, &c. On the lines A, B, and C, there are 50 small divisions betwixt 1 and 2, 2 and 3, 3 and 4, &c. Now, if the first 1 be reckoned 1 or unity,

each of the small divisions between 1 and 2, and 2 and 3, &c., will be $\frac{2}{100}$ or ·02; and if you take the first one to be unity, then the small divisions from the second 1 to 2, 2 to 3 &c., will each be ten times greater than $\frac{2}{100}$, or ·02, each of them will be $\frac{20}{100}$, or $\frac{1}{5}$, or ·2. Again, if 1 represents 100, the first 2 will be 200; if the second 1 be 1000, the second 2 will be 2000, and so on. The above being well understood, we shall now proceed to the use of the rule.

PROBLEM 1.

To multiply the sliding rule.

RULE 1.—Set one on B to one of the factors on A; next against the factor on B, you have the product on A.

EXAMPLES.

1.—Find the product of 3 by 8?

DIRECTION.—Set 1 on B to 3 on A, then against 8 on B will be found the product 24 on A.

2.—Find the product of 24 by 16?

DIRECTION.—Set 1 on B against 16 on A; then look on B for 34, and against it on the line A will be found the product 544.

PROBLEM 2.

To divide by the sliding rule.

RULE 2.—Set the divisor on B to the dividend on A; against 1 on B you have the quotient on A.

EXAMPLES.

1.—Find the quotient of 96 divided by 6?

DIRECTION—Move the slider till one on B stands against 6 on A; then the quotient 16 will be found on B, against the dividend 96 on A.

2.—What is the quotient of 108 divided by 12?

DIRECTION,—Set 12 on B against 1 on A; on the line A will be found the quotient 9 against 108 on B.

PROBLEM 3.

Proportion by the sliding rule.

RULE 3.—Set the first term on the slider B to the second on A; then on the line A will be found the fourth term standing against the third term on B.

EXAMPLE.

1.—If 4 lbs. of brass cost 36d., what will 12 lbs. come to?

DIRECTION.—Move the slider so that 4 on B will stand against 12 on A; then against 36 on B will be found the fourth term 108 on A.

PROBLEM 4.

Superficial measure by the sliding rule.

RULE 4.—Multiply the length by the breadth, the product will be the area.

DIRECTION.—Set 12 on B against the breadth in inches on A; on the line A will be found the surface in square feet against the length in feet on the line B.

EXAMPLE.

1.—What is the content of a plank 18 in. broad, and 10 ft. 3 in. long?

DIRECTION.—Move the slider so that 12 on B stands against 18 on A; then will $10\frac{1}{4}$ on B stand against $15\frac{3}{4}$ on A, which is $15\frac{3}{4}$ square feet.

PROBLEM 5.

To find the solid content of timber by the sliding rule.

RULE 5.—Multiply the length, breadth, and thickness together.

Set the length in feet on C to 12 on D, then on C will be found the content in feet against the square root of the product of the depth and breadth in inches on D.

EXAMPLE.

1.—What is the content of a square log of timber, the length of which is 10 feet, and the side of its square base 15 inches?

Set 10 on C against 12 on D; then will 15 on D stand against the content $15\frac{3}{4}$ on C.

PROBLEM 6.

To extract the square root by the sliding rule.

Move the slider so that the middle division on C, which is marked 1, stands against 10 on the line D; then against the given number on C, the square root will be found on D.

NOTE.—If the given number consists of an even number of places of figures, as 2, 4, 6, &c., it is to be found on the left hand part of the line C; but if odd numbers, as 3, 5, 7, &c., it is to be found on the right hand side of C, one being the middle point of the line.

EXAMPLES.

1.—Find the square root of 81?

The number of places are even, being two; therefore the number 81 is sought for on the left hand side of the line C. Set one on C against 10 on D; then against 81 on C will be found 9, the square root on D.

2.—What is the square root of 144?

Set 1 on C to 10 on D; then against 144 on C will be found the square root 12 on D.

EXERCISE XXIV.

TIMBER TABLE STANDARD MEASURE.

1728	cubical inches ... ... make	1	cubical foot.
144	square inches	1	square foot.
50	feet solid round timber	1	ton.
40	feet solid square timber	1	ton.
1	cubical yard	27	cubical feet.

A load of rough timber = 40 cubic feet; a load of square timber = 50 cubic feet; a ton of shipping = 40 cubic feet; a floor of earth = 324 cubic feet; a cord of wood, 8 feet long, 4 feet broad, and 4 feet deep = 128 cubic feet; a stack of wood, 12 feet long, 3 feet broad, and 3 feet deep = 108 cubic feet; a solid yard of earth = 1 load.

600 sqr. feet of plank, 1 in. thick = 1 load; 400 sqr. feet, 1½ in. thick = 1 load; 300 sqr. feet, 2 in. thick = 1 load; 200 sqr. feet, 3 in. thick = 1 load; 150 sqr. feet, 4 in. thick = 1 load; Russian standard, 12 ft. long, 1¼ in. thick, 11 in. broad; Swedish standard, 14 feet long, 3 in. thick, and 9 in. broad; Norwegian standard, 12 feet long, 3 in. thick, and 9 in. broad. The above are the standard rates in London.

The English foot being divided into 1000 parts, the following will be the proportions in foreign measures.

English foot	1068	Danish	1040
Paris	1068	Swedish	997⅔
Venetian	1161	Derahor Cubit of Cairo ...	1824
Ringland	1033	Persian Arish	3197
Strasburgh	952	Great Turkish Pike	2200
Dantzic	944	Russia	928

To bring feet to English.

RULE.—Multiply the part you require by 12, and divide by 1000, and you have the proportions to 12 inches or 1 foot English and its decimal parts.

EXAMPLE.

Take Paris = 1068
12

÷1,000) 12,816

feet 12·816 parts English.

SUPERFICIAL MEASURE.

PROBLEM 1.

To find the area or superficial content of a board or plank.

RULE 1.—Multiply the length by the breadth, the product will be the *content.* When the board is tapering, add both ends together, and

half the sum will be the mean breadth; then multiply the mean breadth by the length, the product will be the superficial content.

EXAMPLES.

1.—In a board 12 feet long and 8½ inches broad, how many feet? Ans. 8 feet 6 inches.
2.—What is the content of a plank 14 inches broad, and 16 feet 6 inches long? Ans. 19 feet 3 inches.
3.—In a board 15 feet 6 inches long and 10 inches broad, how many feet? Ans. 12 feet 11 inches.
4.—Find the content of a plank 20¾ feet long and 12½ inches broad? Ans. 21 ft. 7 in. 4 sec. 6th.

PROBLEM 2.

When length, breadth, and depth are given, the length being feet, and the breadth and depth inches.

RULE 2.—Multiply the breadth by the depth; $\frac{1}{12}$ of the product multiplied by the length will give the measure in feet.

EXAMPLES.

1.—How many square feet are there in a plank 16 feet long, 9 inches broad, and 4 inches thick? 16 × 3 = 48 feet. Ans.
2.—How many square feet are there in a plank 21 feet long, 18 inches broad, and 3½ inches thick? 21 × 5 = 105 feet. Ans.
3.—In five planks, each 15 feet long, 8 inches broad, and 3 inches thick, how many feet? 15 × 10 = 150 feet. Ans.
4.—In twelve planks, each 11 feet long, 9 inches broad, and 4 inches thick, how many feet? 132 × 3 = 396 feet. Ans.

SUPERFICIAL MEASURE IN YARDS, FEET, AND INCHES.

PROBLEM 3.

RULE 3.—If the measure be required in any other name greater than feet, first find it in feet, and then bring them to the denomination required.

EXAMPLES.

1.—How many yards in a carpet, 7 yards 1 foot 4 inches long, 5 yards 2 feet 3 inches broad? Ans. 42 yds. 9 ft. 8 ins.
2.—What is the content of a floor, 13 yards 2 feet 9 inches long, 5 yards 1 foot 7 inches broad? Ans. 76 yds. 11 ft. 1½ in.

SOLID MEASURE IN YARDS, FEET, AND INCHES.

PROBLEM 4.

RULE 4.—Multiply length, depth, and thickness for the content.

EXAMPLES.

1.—What are the solid contents of a wall, 13 feet 6 inches long, 5 feet 8 inches high, and 2 feet 7 inches broad?
× length 13 6 by 5 8=67 6×2 7=197 ft. 7 ins. 6 pts. Ans.

2.—What are the contents of a cistern, 9 yards 2 feet long, 6 yards 2 feet broad, and 4 yards 2 feet deep? Ans. 300 yards 20 feet.
3.—What are the contents of a box, 6 feet 2 inches long, 3 feet five inches broad, and 2 feet 9 inches deep? Ans. 57 ft. 11 in. 3 pts. 6″ 11′ 2‴.
4.—What is the solid measurement of a bale of goods, 3 feet 2 inches long, 2 feet 7 inches broad, and 11 inches deep? Ans. 7 ft. 5 in. 11 pts. 10 s.

PROBLEM 5.

To find the solidity of square or four-sided timber.

RULE 5.—Multiply the mean breadth by the mean thickness, and the result by the length. If the tree be equally broad and thick, the breadth and thickness, anywhere taken, will be the mean breadth and thickness; but if it tapers regularly from one end to the other, the breadth and thickness taken in the middle, will be the mean breadth and thickness. If the tree is thicker in some places than in others, find the content of each separately.

EXAMPLES.

1.—How many solid feet in a piece of timber, 12 feet long, 3 feet broad, and 2 feet thick? Ans. 72 feet.
2.—Required the solid content of a tree, 16 feet long, and 14 inches the side of the square? Ans. 21 ft. 9 ins. 4 pts.
3.—What is the solid content of a tree, 14 feet long, and 10½ inches the side of the square? Ans. 10 ft. 8 ins. 7 pts. 6 s.
4.—What is the solid content of a piece of timber or stone, whose sides are 10 inches by 18, and the length 18 feet? Ans. 22 ft. 6 ins.

PROBLEM 6.

To find the solidity of unsquared or round timber.

RULE 6.—Multiply the square by the square in inches, &c., and that product by the length in feet, &c., divide that product by 144, and you will have the solid feet. If any should remain, divide by 12 for inches.

EXAMPLES.

1.—Admit a piece, 20½ feet long, by 10½ inches square, (which is a quarter of the line contained round the same): required the solid content in feet? Ans. 14 ft. 11 ins.
2.—What is the solid content of a round tree, 25 feet long, and girt in the middle 45 inches? Ans. 21 ft. 11 ins. 8 secs. 9 thds.
3.—How much timber in a round tree, 30 feet long, and the girt 42 inches? Ans. 22 ft. 11 ins. 7 secs. 6 thds.

PROBLEM 7.

Unequal-sided timber.

RULE 7.—Multiply breadth and thickness together in inches and half inches, and that product by the length in feet, which, divided by 144,

cutting off so many decimal figures as there are in the operation, the content will be solid feet; the remainder, divided by 12, gives inches.

EXAMPLE.

1.—A piece of timber 26½ feet long, 18½ inches broad, and 14½ inches thick, how many solid feet?

× 18·5 by 14·5 = 2682·5 × 26·5 = 7108·625 ÷ by 144 =
49 ft. 4 ins. 4 pts. solid. Ans.

PROBLEM 8.

To find the content of triangular timber.

RULE 8.—Multiply the base by the perpendicular in inches, and half that product by the length in feet; divide the result by 144; it will then give the number of solid feet. Divide the remainder by twelve for the inches.

EXAMPLE.

1.—In a piece of timber whose sides are triangular, viz., the base 26 inches, perpendicular 17½ inches, and the length 12 feet, how many solid feet?

× 26 by 17½ = 455, ½ of = 227½ × by 11 = 2730 ÷ by 144 =
18 ft. 11 ins. 6 pts. solid. Ans.

PROBLEM 9.

Mahogany.

RULE 9.—Multiply breadth by depth in inches, and that product by the length in feet, which last product, divided by 12, gives the superficial inch-feet required.

EXAMPLES.

1.—In a mahogany log 25½ inches broad, 16 inches thick, and 15½ feet long, how many superficial inch-feet?

× 25½ by 16 = 408 × 15½ = 6324 ÷ 12 = 527 inch-feet. Ans.

2.—In a log, 33 inches broad, 19 inches thick, and 23½ feet long, how many superficial feet?

× 33 × 19 = 627 × 23½ = 14734½ ÷ by 12 = 1227⅞ inch-feet. Ans.

3.—In four planks of mahogany, each 25 feet long, 9½ inches broad, and 3 inches thick, how many feet? Ans. 142½ ft.

4.—In six planks, each 18 feet long, 8½ inches broad, and 1¼ inch thick, how many feet? Ans. 99 ft. 7½ in.

SPECIFIC GRAVITY.

Specific gravity is the relative weight of any body compared with the weight of another taken as a standard of the same bulk. The standard is water: one cubic foot weighs 1000 ounces avoirdupois, at a temperature of 60 Fahrenheit.

TABLE OF THE GRAVITY OF WOOD, FROM CORK TO LIGNUMVITÆ.

	Specific Gravity.		Specific Gravity.
Cork	246	Maple and Riga Fir	750
Poplar	383	Ash and Dantzic Oak ...	760
Larch	544	Yew, Dutch	788
Elm and English Fir	556	Apple Tree	793
Mahogany, Honduras	560	Alder	800
Willow	585	Yew, Spanish	807
Ceder	596	Mahogany, Spanish	852
Pitch Pine	560	Oak, American	872
Pear Tree	661	Boxwood, French	912
Walnut	671	Logwood	913
Fir, Forest	694	Oak, English	970
Beech	696	Ditto, sixty years' cut ...	1170
Cherry Tree	715	Ebony	1331
Teak	745	Lignumvitæ	1333

PROBLEM 10.

To find the magnitude of any body from its weight.

RULE 10.—Weight of the body in ounces divided by its specific gravity in table = content in cubic feet.

EXAMPLE.

1.—How many cubic feet are there in one ton of mahogany?

1 ton = 20 cwt. = 35840 ounces in a ton.

Look to mahogany, and opposite you will find 560, which, divided into the ounces of a ton, will stand thus :—

÷ 560)35840 = 64 cubic feet. Ans.

Had the timber been fir, look to fir and you will find 556, which, divide into the ounces of a ton, thus :—

÷ 556)35840 ounces = 64·46 cubic feet. Ans.

Or English Oak :— ÷ 970)35840 = 36·94 cubic feet. Ans.

PROBLEM 11.

To find the weight of a body from its bulk.

RULE 11.— Cubic feet × specific gravity = weight in ounces.

EXAMPLE.

1.—What is the weight of a log of larch, 14 feet long, 2¼ broad, and ¼ thick?

ft. ft. ft.

2·5 × 1·15 × 14 = 43·750 : then,

43·750 × 544 = 23800 ounces = 13 cwt. 1 qr. 3 lbs. 8 oz. Ans.

PROBLEM 12.

Sawyers' Work.

Measure off your several cuts alternately with a line, which afterwards measure on a rule.

RULE 12.—Multiply the line by length in feet and inches, and you will have the product required.

EXAMPLE.

1.—Admit 34 feet 6 inches line, by 9½ feet long?

ft. in. ft. in.
× 34 6 by 9 6 = 327 feet 9 inches.

EXERCISE XXV.

JOINERS' WORK.

TABLES.

The square of 10 feet=100 supercial feet; 100 superficial feet=1 square of boarding, flooring, &c.; 38 deals, 12 feet long, 2½ inches thick, make 1 ton.

TEN FEET BOARDS TO A SQUARE.

24 boards, 5 inches broad.
20 boards, 6 inches broad.
17 boards, 7 inches broad, add 1 foot.
15 boards, 8 inches broad.
13 boards, 9 inches broad, add 2 feet 6 inches.
12 boards, 10 inches broad.

TWELVE FEET BOARDS TO A SQUARE.

20 boards, 5 inches broad.
16 boards, 6 inches broad, add 4 feet.
14 boards, 7 inches broad, add 2 feet.
12 boards, 8 inches broad, add 4 feet.
11 boards, 9 inches broad, add 1 foot.
10 boards, 10 inches broad.

Thirteen 12-feet deals=1 square of wrought flooring; Twelve and a half 12-feet deals=1 square of rough flooring; Fourteen 12 feet battens=1 square of wrought flooring.

EXAMPLES.

1.—A piece of work, 96 feet 3 inches, by 21 feet 3 inches: required the number of squares contained therein.

ft. in. ft. in. sq. ft. in.
× 96 3 by 21 3 = 2045·3·9 ÷ 100 = 20 45 3¾. Ans.

2.—A piece of work, 14 feet 6 inches, by 10 feet 3 inches: required the square yards contained?

ft. ft. yds.
× 14½ by 10¼ = 148⅛ × by 9 = 16 7/72 Ans.

EXERCISE XXVI.

CALCULATION OF GLAZIERS' WORK.

The dimensions used are feet, inches, and parts; in some instances feet, tenths, and hundredths. The work is calculated in square feet.

Windows are sometimes measured by taking the dimensions of one pane, and multiplying its superfices by the number of panes. But generally they take the length and breadth of the whole frame for the glazing. Circular windows are measured as if they were square, taking for their dimensions the greatest length and breadth.

EXAMPLES.

1.—In a pane of glass, 3 feet 6 inches and 9 parts long, and 1 foot 3 inches and 3 parts broad, how many feet of glass in that pane?
× 3·6·9 by 1·3·3 = 4 ft. 6 in. 3 pts. 11 sec. 3 thds. Ans.

2.—If a window be 7 feet 6 inches high, and 3 feet 4 inches broad, how many square feet of glass are in it? Ans. 25 feet.

3.—How many feet in an elliptical fan-light, 14 feet 6 inches in length, and 4 feet 9 inches in breadth? Ans. 68 feet 10 inches.

4.—What will the glazing of a triangular sky-light come to at 20d. per foot, the base being 12 feet 6 inches, and the highest 6 feet 9 inches? Ans. £3 10s. 3¼d.

EXERCISE XXVII.

CALCULATION OF BRICKLAYERS' WORK.

Bricklayers' work is generally measured by the rod of 16½ feet, or 272¼ square feet; but sometimes by the perch of 21 feet long, 9 inches thick, and 1 foot high. To reduce cubic feet to the standard, multiply by 8 and divide by 9.

TABLE.

1 square yard of clay makes 460 bricks.	272 superficial feet, 1½ brick thick, 1 rod of reduced brickwork.
32 bricks cover 1 square yard.	306 cubic feet, 1 rod.
10 bricks, 1 superficial foot guaged arching.	500 bricks, 1 load.

RULE FOR PERCHES.—Multiply length by heighth, and that product by the thickness, divide by 9, and the last quotient by 21, which will give the standard measure.

EXAMPLE.

1.—A piece of work, 66 feet long, 20 feet 6 inches high, and 28 inches thick, how many perches are contained therein?

ft. ft.
× 66·0 by 20·6 = 1353 × 28 = 37884 ÷ 9 = 4209·3 ÷ 21 =
200 p. 9 ft. 3 in. Ans.

NOTE.—One thousand of our common bricks (mortar and work) will make four perches and a quarter of work.

Two hundred and thirty-six bricks (mortar and work) will make a perch.

MASONS' WORK.

TABLE.

16 cubic feet Portland stone = 1 ton.	12½ cubic feet granite ... = 1 ton.
17 cubic feet Bath stone = 1 ton.	13 cubic feet of marble ... = 1 ton.
15 cubic feet Yorkshire stone = 1 ton.	14½ ditto paving stone ... = 1 ton.

Twenty-one feet long, twelve inches high, and eighteen inches thick, make a perch.

Multiply length and height together, in feet and inches, and the product multiply by the inches in thickness, divide by 18, and that quotient by 21, gives the perches; but when the thickness is 18 inches only, multiply the given length and height together, and divide by 21 for perches.

To find the solid content of a marble block.

RULE 2.—Multiply length by breadth in feet and inches, and that product by the depth in feet and inches, which will give you the solid content in feet.

2.—How many solid feet in a marble block, 6 ft. 6 ins. long, 2 ft. 4 ins. broad, and 1 ft. 3 ins. thick?

ft. in. ft. in. ft. in. ft. in.
× 6 6 by 2 4 = 15 2 × 1 3 = 18 ft. 11 ins. 6 pts. Ans.

3.—What is the content of a marble block 10 feet 6 inches long, 4 feet 6 inches broad, and 1 foot 6 inches thick?

× 10 ft. 6 in. by 4 ft. 6 in. = 47 ft. 3 in. × 1 ft. 6 in. = 70 ft. 11 ins. 6 pts. Ans.

4.—What is the content of a block 4 feet 3 inches long, 2 feet 6 inches broad, and 2 feet 1 inch thick? Ans. 22 ft. 6 ins. 0 pts. 7″. 6‴.

SLATERS' WORK.

TABLE.

		ft.	in.		ft.	in.
120 slates ... make ... 1 hundred.	Doubles	1	6	by	0	6
½ ton Westmoreland. 1 square.	Ladies	1	3	by	0	8
1 ton Welsh Rags ... 1 square.	Countesses	1	10	by	0	11
360 Tavistock slates ... 1 square.	Duchesses	2	2	by	1	3
308 Lady slates ... ... 1 square.	Rags and Queens ...	3	3	by	2	3
200 Countesses ... ... 1 square.	Imperial and Patent	2	8	by	2	9
110 Duchesses ... ... 1 square.						

Slating and tiling are measured by the foot, yard, or square of 100 feet.

To find the content.

RULE—Multiply the length of the ridge by the girth, over, from eave to eave; allow for the double row at the bottom, or for how much one row is laid over another. It is usual, in some cases, to add the length of the valley, or hip, to the content in feet.

EXAMPLE.

1.—How many squares in a roof of double slating, 68 feet long, and 19½ feet from the eve to the pitch of the roof?

× 68 by 19½ = 1326 ÷ by 600 = 2½ nearly.

WELL SINKING.

TABLE.

		Gals.			Gals.
A well, 3 feet diameter, per foot		44	A well, 7 feet diameter, per foot		239
„ 4 ditto	ditto	73	„ 8 ditto	ditto	313
„ 5 ditto	ditto	122	„ 9 ditto	ditto	396
„ 6 ditto	ditto	176	„ 10 ditto	ditto	489

EXERCISE XXVIII.

TONNAGE OF SHIPS.*

RULE 1.—Multiply the length of the keel, taken within the vessel, by the length of the midship beam, taken within, from plank to plank, and that product by half the breadth, taken as the depth; then divide the last product by 94, and the quotient will be the tonnage.

EXAMPLES.

1.—If the length of a ship's keel be 80 feet, and midship beam 30, give the required tonnage?

× 30 by 80 = 2400 × 15 = 3600 ÷ 94 = 382$\frac{92}{94}$ tonnage.

2.—If the length of a ship's keel be 87 feet 6 inches, and the midship beam 28 feet 8 inches, find the required tonnage? Ans. 385$\frac{3}{4}\frac{3}{4}$.

RULE 2.—Take the dimensons on the outside of the light mark, as the ship floats unladen, to find the content of the empty ship. But if the measure of the ship taken from the light mark to her full draught of water, when laden, it will give the burden of the ship; then the length breadth, and depth multiplied together, and the product divided by 100 for men-of-war (which gives an allowance for guns, anchors, &c., that are all burdens, but no tonnage), and by 95 for merchant ships, will give the tonnage.

Observe.—A hundred solid feet make a ton.

3.—Required the tonnage of Noah's Ark, the length being 300 feet, breadth 50, and depth 30?

× 300 by 50 = 15000 × 30 = 450,000 ÷ by 95 = 4736$\frac{1}{9}\frac{8}{5}$ tonnage. Ans.

The shipwrights of London multiply the length of the keel by the extreme breadth of the ship taken from out to outside, and that product by half the breadth; and this they divide by 94 for merchant ships, and 100 for men-of-war; the quotient is the tonnage of the respective classes.

4.—What is the tonnage of an 80-gun ship, the length of whose keel is 149 feet 4 inches, and the extreme breadth 49 feet 8 inches? Ans. 1841$\frac{6}{7}\frac{4}{4}$.

5.—The given length of keel of a 74 is 138 feet, and the extreme breadth 46 feet 9 inches; what is the tonnage? Ans. 1508$\frac{2}{8}\frac{9}{0}\frac{0}{0}$.

* Though the Admiralty have changed their mode of calculating for the tonnage of ships, the above method will be found more simple, brief, as accurate, and less complicated.

A method practised by the Royal Navy.

DIRECTIONS.—Let fall a perpendicular from the foreside of the stern at the height of the hawsehole, and another from the back of the main port at the height of the wing transom; from the distance between these perpendiculars deduct $\frac{3}{5}$ of the extreme breadth, and as many times $2\frac{1}{2}$ inches as there are feet in the height of the wing transom above the upper edge of the keel; the remainder is the length of the keel for tonnage.

RULE 4.—Multiply the length of the keel by the extreme breadth and that product by half the breadth; then divide by 94 for the tonnage.

6.—Given the length of the keel, 68 feet, and the extreme breadth, 22; required the tonnage? Ans. $175\frac{6}{94}$.

7.—What is the tonnage of a ship whose keel is 78 feet, and the extreme breadth $24\frac{1}{2}$? Ans. $249\frac{3}{94}$.

8.—The length of the keel is 70 feet, and the extreme breadth 24; what is the tonnage? Ans. $214\frac{4}{94}$.

FOREIGN WEIGHTS AND MEASURES.

CAPE OF GOOD HOPE.

LIQUID MEASURE.

16 flasks	=	1 anker.
4 ankers	=	1 aam.
4 aams	=	1 leaguer.

CORN.

4 schepels	=	1 muia.
10 muias	=	1 load.

The muia of wheat weighs 196 lbs. English = 3 imperial bushels.

CLOTH AND LONG MEASURE.

12	Rhyland inches	=	1 Rhyland foot.
27	ditto	=	1 Dutch ell.
144	ditto	=	1 square foot.
164	square feet	=	1 rood.
600	roods	=	1 morgen.

CHINA.—CANTON.

Merchandise weights are the pecul, catty, and tael. The pecul is divided in 100 catties, or 1600 taels.

1 tael weighs avoirdupois	=	$1\frac{1}{3}$ oz.
16 taels, or 1 catty	=	$1\frac{1}{3}$ lbs.
100 catties, or 1 pecul	=	$133\frac{1}{3}$ lbs.

A pecul weighs 162 lbs. 3 dwt. 3 grs. troy. English weights are used in delivering a cargo, and are afterwards changed into catties and peculs.

The weights are the candy of 20 mounds; the mound is divided into 8 vis, 320 pollams, or 3200 pagodaes: this vis is divided into 5 seers. The candy of Madras = 500 lbs. avoirdupois; the pagoda, 2 oz. 3 grs.

The measures of capacity are the garce (or corn measure), containing 80 parahs, or 400 marcals, each marcal 8 puddies, or 64 ollocks. The marcal measures 750 cubic inches, and weighs 27 lbs. 2 oz. 2 drs. of spring water, consequently 45 marcals are equal to 15 Winchester bushels.

FRANCE.*

The mètre, or unit of length, is supposed to be the 10 millionth part of the distance from the pole to the equator.

The gramme, or unit of weight, is a cubic centimètre, or the 100th part of a mètre of distilled water of a temperature of melting ice; 15·434 English grains troy.

Multiplying.—Decca means 10 times; Hecto, 100 times; Kilo, 1000 times; Myra, 100,000 times.

Dividing.—Deci means 10th part; Centi, 100th part; Milli, 1000th part.

SUPERFICIAL MEASURE IN ENGLISH DENOMINATIONS.

The *Are* is a square decamètre, and is the element of square measure.

	perches.	yards.
Are	3	28·8546
Decare	39	16·296

	a.	rd.	p.	yds.
Hectare	2	1	35	11·046

LINEAL MEASURE.

Mètre is the element in this measure.

	inches.
Millimètre	0·39371
Centimètre	·39371
Decimètre	3·93710
Mètre 3 ft. 3 in. 4½ pts. Eng.	39·37100

	m.	fur.	yds.	ft.	in.
Decamètre	0	0	10	2	9·7
Hecatomètre	0	1	109	1	1
Kilomètre	0	4	313	1	10
Myriomètre	6	1	136	1	2

SOLID MEASURE.

Stere, a cubic mètre, is the element of this measure.

	Cubic feet.
Decistere	3·5317
Stere	35·317
Decastere	353·17

MEASURE OF CAPACITY.

The *Litre*, a cubic Decimètre, is the element of all measures of Capacity.

	Cubic inches.
Millilitre	·06103
Centilitre	·61028
Decilitre	6·10280

English Liquid.	t.	h.	g.	p.	in.
Litre	0	0	0	1	26·369
Decalitre	0	0	2	1	21·007
Hecatolitre	0	0	22	0	2·816

English Liquid.	t.	h.	g.	p.	in.
Kilolitre	0	3	31	0	28·16
Myriolitre	8	2	59	0	4·328

DRY MEASURE.

	qrs.	bus.	pks.	gl.	pt.	in.
Litre	0	0	0	0	1	26·369
Decalitre	0	0	1	0	1	21·077
Hecatolitre	0	2	3	0	0	2·816

	qrs.	bus.	pks.	gl.	pt.	in.
Kilolitre	3	3	2	0	0	28·16
Myriolitre	34	3	0	1	0	4·328

* Notwithstanding we have given Four very useful Tables on French weights and *measures, in page 53*, we here subjoin more ample ones for the benefit of the reader.

WEIGHT.

The Gramme is the element of weight.

	grs.
Milligramme	·0154
Centigramme	·1544
Decigramme	1·5444
Gramme	15·4440

Troy	lbs.	oz.	dwts.	grs.
Decagramme ...	0	0	6	10·44
Hecatogramme...	0	3	4	8·40
Kilogramme ...	2	8	3	12·02
Myriogramme ...	26	9	15	0·23

Avoirdupois	lbs.	oz.	drs.
Decagramme	0	0	5·65
Hecatogramme... ...	0	3	8·5

Avoirdupois	lbs.	oz.	drs.
Kilogramme	2	3	5
Myriogramme	22	1	2

WEIGHTS.

	grammes.	TROY. lbs.	oz.	dwts.	grs.	AVOIRDUPOIS. lbs.	oz.	drs.
Kilogramme ...	1,000	2	8	3	2	2	3	4½
Livre usuelle ...	500	1	4	1	13	1	1	10¼
Livre half ...	250	0	8	0	18·5	0	8	13½
Livre quarter ...	125	0	4	0	9·25	0	4	6¾
Livre eighth ...	62·5	0	2	0	4·5	0	2	3¼
Once	31·3	0	1	0	2·25	0	1	1⅛
Once half	15·6	0	0	10	1·125	0	0	8⅝
Once quarter ...	7·8	0	0	5	0·5	0	0	4⅓
Gros	3·9	0	0	2	12·25	0	0	2¼

LINEAR MEASURE.

	Metres.	ft.	in.	parts.
Toise	2	6	6	9
Pied (foot) ...	⅓	1	1	1½
Pouce (inch) ...	$\frac{1}{36}$	0	1	1½
Aune (yard) ...	1½	3	11	3
Aune half ...	¾	1	11	7½
Aune quarter...	$\frac{3}{10}$	0	11	9¾

	Metres.	ft.	in.	parts.
Aune eighth ...	$\frac{3}{80}$	0	5	10⅞
Aune sixteenth	$\frac{3}{40}$	0	2	$11\frac{1}{16}$
Aune one-third	⅔	1	3	9
Aune one-sixth	⅓	0	7	10½
Aune one-twelfth	$\frac{1}{10}$	0	3	11¼

MEASURE OF CAPACITY.

Boisscau... ... 125 Litres ... ... 2·837 gallons.
Litron ... ∴ 1·074 Paris pinte ... 2⅛ English pint.

With halves and quarters in proportion.

GERMANY.—BREMEN.

2 loths = 1 ounce.
8 ounces " 1 mark.
2 marks " 1 commercial lb., or 7690 English grs.
1 centner " 116 lbs.

DRY MEASURE.

4 pints ... ... = 1 viertel.
4 viertels ... ... " 1 scheffel.
10 scheffels ... " 1 quart.
4 quarts... ... " 1 last.

1 last = 10 qrs. 0·7 bushels; a barrel of salt = 3⅓ scheffels; a last of coals = 2 chaldrons, Newcastle measure.

1 shippound... = 2½ centners, or 290 lbs.
1 wadge of iron " 120 lbs.
1 stone of flax " 20 lbs.
1 ditto of wool " 10 lbs.
1 ton of butter " 300 lbs.

LIQUID MEASURE.

8 quarts... ... = 1 viertel.
5 viertels ... " 1 anker.
4 ankers ... " 1 tierce.
1½ tierce ... " 1 oxhoft.
1 oxhoft ... " 38 English wine gals

A barrel of whale oil = 6 stecken, or 216 lbs. = 31½ English wine gals. Accounts are kept in rix dollars of 72 grotes; the grote is divided into 5 swares; a Bremen rix dollar = 3s. 2d. sterling: par of exchange, £1 sterling = 6 rix dollars, 32 grotes, 4 swares.

HAMBURGH.

WEIGHTS.

1 centner ... = 112 pounds.
1 lb. ... ... " 32 ounces.
1 oz. ... ... " 4 drachms.
1 drachm ... " 4 pfennings.
1 schiffpund. . " 2½ centners, or 20 liespfund of 14 lbs. each, or 280 lbs.
1 pipe of oil = 820 lbs.; a barrel of butter (willow and hoops) 224 lbs.; common hoops 230 lbs. nett.

GRAIN MEASURE.

1 last ... = 60 fass.
1 fass ... " 2 himpten.
1 himpten " 4 spint.
20 fass ... " 1 wispel of wheat or rye.
30 fass ... " 1 do. oats or barley.
2 fass ... " 1 scheffel of wheat.
3 fass ... " 1 do. of oats or barley.
1 Hamburg last = 11 imperial quarters.

LIQUID MEASURE.

1 fuder... = 6 aums.
1 aum ... " 4 ankers, or 5 emers.
1 anker. . " 5 viertels.
1 viertel " 2 stubchen.
1 stubchen " 2 kannen.
1 kannen " 2 œssel quartiers.
1 emier... " 4 viertels.

1½ aums, or 6 ankers, or 30 viertels, each of 8 quartiers, or bottles = 1 hogshead.

Accounts are kept in marks of 12 pfennings of two sorts—banco and current; the banco estimated at 1s. 5½d.; the mark current at 1s. 2½d., sterling.

NAPLES.

The weights are the cantaro and rotola. The cantaro gross = 196½ lbs. avoirdupois; the cantaro piccolo 106 lbs. avoirdupois. In corn, 36 tomolo = 1$\frac{8}{10}$ Winchester bushel.

In wine the carro is 2 botti, 24 barrile or 1440 cariffe. 1 carro = 264 English wine gallons. A pipe of wine or brandy is 132 English gallons. *Oil.*—The salma is divided into 16 staje; 256 quarti or 536 misurette; 1 salma = 42¾ English wine gallons. *Long Measure.*—The canna is divided into 8 palmi, or 94 onzie, and = 6 feet 11 inches English. Accounts are kept in ducati di regno of 100 grani. 1 ducat = 10 carlina, or 3s. 5½d. nearly, sterling. The oncetta = 10s. 3½d., the smallest gold piece.

PORTUGAL.—LISBON.

WEIGHTS.

8 ounces make a marc, 2 marcs a pound or arratel, 22 pounds 1 arroba, 4 arrobas 1 quintal. For corn and salt the measure is the moyo, divided into 15 fanegas, 30 alquirès, 240 quartos, &c. *Liquids.*—The almude is divided into 2 potes, 12 canadas, or 48 quartelles. 18 almudes = 1 baril; 26 almudes = 1 pipe; and 52 almudes = 1 tonelado, which last 227¼ English *wine gallons*. A Lisbon pipe of 31 almudes is equal to 140 English gallons.

LENGTH.

3 palmos make a covado or cubit; 1⅔ covados=1 vara; 2 varas=1 branco. Accounts are kept in rees, 1000 of which make 1 milrae. The gold piece of 6400 rees=35s. 11d. sterling, and the gold cruisado=2s. 3d.

PRUSSIA.—DANTZIC.

32 loths	make	1 ounce.	33 pounds	make	1 large stone.
16 ounces		1 pound.	110 pounds... ...		1 centner.
16½ pounds... ...		1 lispound.	3 centners ...		1 shippound.
20 pounds		1 small stone.			(330 lbs.)

LIQUID MEASURE.

5 quarts...	make ...	1 anker.	2 hhds. ...	make ...	1 both.
4 ankers		1 ahm.	2 boths...		1 fuder.
1½ ahm...		1 hhd.	2 fuders...		1 last.

A pipe = 2 ahms; the ahm = 39¾ English gallons.

CORN MEASURE.

The last of 60 scheffels=11 quarters, 3 bushels, and the last of 56½ scheffels=10 quarters, 7 bushels. Oak planks, deals, and pipe staves are sold per shock of 50 pieces. Wheat, rye, &c., of 56½ scheffels. Accounts are kept in thalers or dollars, silver groschen and pfennings.

1 thaler	= 30 silver groschen.	The thaler is generally estimated at 3s.
1 groschen	= 12 pfennings.	

RUSSIA.—PETERSBURGH.

Gold, Silver, or Merchandise.—3 sotnicks make 1 loth; 32 loths 1 pound; 40 pounds, 1 pood; 10 poods, 1 berkovitz. The pood=36 lbs. 10 oz. 11 drs. avoirdupois.

The chief measure in corn is the chetwert, subdivided into 2 osmins, 4 pajocks, 8 chetwericks, or 64 garnitz.

Accounts are kept in roubles of 100 copecks. The gold and silver coins are—the imperial or 10 rouble pieces = £1 12s.; half imperial = 16s.; silver rouble = 3s. 2¾d.

SPAIN.—CADIZ.

As there are such discripancies in weights and measures in the different provinces, we shall give those of Castile.

The quintal is divided into 4 arrobas, or 100 lbs. of 2 marcs each; 100 Castile lbs. = 101½ avoirdupois lbs.; 100 baras or yards = 12¾ English yards. In corn measure, there is the cahiz, divided into 12 panegas, or 144 celeminas, or 576 quartillas. 5 panegas=1 English quarter.

LIQUID MEASURE.

The cantaro or arroba is divided into 2 azumbres and 32 quartillas. There are two sorts of arrobas, the greater and lesser: the former=4¼ English wine gallons, the latter 3¼ ditto.

1 mazo makes 16 arrobas; 1 botta = 30 arrobas wine, or 39½ oil; 1 pipe = 27 arrobas wine, or 34½ oil; 1 botta = 127½ English gallons, and 1 pipe = 114¾ ditto.

TUSCANY.—LEGHORN.

The pound is divided into 12 ounces, 96 drachms, 288 denai, and 6912 grani, and equal 5240 English grains. The quinta or centinajio = 150 lbs.; the centaro = 150 lbs., but a centaro of sugar = 151 lbs., oil 88 lbs., brandy 120 lbs., stock fish 160 lbs. The rotolo = 3 lbs. Corn is sold by the sack or sacco, 4 of which are equal to one imperial quarter.

LIQUID MEASURE.

2 mezette = 1 boccale; 2 boccali = 1 fiasco; 20 fiaschi = 1 barile or 12 English wine gallons; the barile of oil is about 66 lbs. avoirdupois, or 16 fiaschi of 2 boccali each.

Long Measure is bracico, divided into 20 solidi, 60 quattrine or 24 denaii. 155 bracci = 100 English yards. 1 canna of 4 bracci = 12 English inches.

Accounts are kept in lire Tuscane: the lire is divided into 20 solidi di lire, each of 5 centicimi.

FOREIGN MONIES.

FOREIGN RAILWAY VALUE OF COIN.

Gold.	Francs.	Cents.	Silver.	Francs.	Cents
A Sovereign	25	20	A French Crown... ...	5	70
A Frederic	21	0	A Brabant Crown ...	5	68
A William	21	16	A Prussian Thaler ...	3	70
A Pistole	20	75	A Dutch Guilder ...	2	50
A Ducat	11	50			

AMERICA.—UNITED STATES.

Half-cent, 200th part of a dollar, $\frac{1}{4}$ $\frac{1}{8}\frac{1}{4}$d. Cent, 100th part of a dollar, $\frac{1}{4}$ $\frac{1}{3}\frac{1}{2}$d. Quarter dollar, silver, 1s. $0\frac{3}{4}$d. Half-dollar, 2s. $1\frac{1}{2}$d. Dollar, 4s. $3\frac{1}{2}$d. Eagle, of $2\frac{1}{2}$ dollars, gold, 10s. $11\frac{3}{4}$d. Eagle, of 5 dollars, £1 1s. $10\frac{3}{4}$d. Double Eagle, of 10 dollars, £2 3s. $9\frac{3}{4}$d.

The currency of the United States varies in point of relative value in many of the States; the dollar in some parts passing for 8s., 7s. 6d., 6s., and 4s. 8d. In some places are found the disme, or dime, about $5\frac{1}{2}$d. and the half-dime.

ARABIA.

Carret, $0\frac{1}{8}$d. Caveer, $0\frac{3}{8}$d. Comashee, $0\frac{20}{100}$d. Larin, $10\frac{1}{4}$d. Abyss, 1s. $4\frac{1}{8}$d. Piastre, *a* 4s. 6d. Dollar, 4s. 6d. Sequin, 7s. 6d. Tomaun, £3 7s. 6d.

AUSTRIA AND BOHEMIA.

4 Pfennings, 1 kreutzer, $0\frac{2}{4}$d. Groschen, $1\frac{2}{4}$d. Batzen, $1\frac{2}{4}$d. 10 kreutzer, silver, 4d. 20 kreutzer, ditto, $8\frac{1}{4}$d. Half-rix dollar, or florin (guilden), $2\frac{1}{4}$d. Conventional dollar, silver, 4s. $0\frac{1}{2}$d. Crown, since 1753, 4s. $1\frac{1}{2}$d. Quarter sovereign, gold, 7s. $4\frac{1}{2}$d. Half sovereign, gold, 14s. 9d. Hungarian ducat, *gold*, 9s. $5\frac{1}{4}$d. Emperor's ducat, 9s. 5d.

The currency in 1753 was raised to a standard of coining a mark of fine silver into 20 florins, or 13½ dollars; this is what is called conventional money, or 20 florins standard. At Vienna the new Wiener Wahrung coin loses about $\frac{3}{8}$.

BADEN, HESSE DRAMSTADT, FRANKFORT-ON-MAINE, AND WURTEMBERG.

60 Kreutzers, or 13 Groschen, 4 Pfennings, 1 florin. Florin piece, silver, 1s. 3¾d. 2 Florin piece, silver, 3s. 3½d. Florin piece, gold, 8s. 4½d. 2 Florin piece, gold, 16s. 8½d.

There are also in circulation Louis-d'ors, worth 10 and 11 florins; Ducats, worth 5 florins, and 5 florins, 30 kreutzers; Crowns, worth 2 florins, 24 kreutzers; and Conventional Dollars, worth 2 florins, 24 kreutzers, besides many small coins. More Florins are supposed to be coined out of the mark of fine silver than in Austria, hence its diminished value.

BARBADOES.

2 Half-pennies, 1 penny, $0\frac{5}{8}\frac{7}{0}$d. Bit, 5⅜d. Shilling, $8\frac{1}{2}\frac{1}{0}$d. Dollar, 4s. 6d. Crown, 5s. Pound, 14s. 3d.

BARBARY.

Asper, $0\frac{5}{8}$d. Medin, 1⅜d. Rial old plate, 6¾d. Double, 1s. 1½d. Dollar, 4s. 6d. Silver chequin, 3s. 4d. Zequin, 8s. 10d. Pistole, 16s. 10½d.

BENGAL.

Pice, $0\frac{6}{3}\frac{}{2}$d. Farram, $0\frac{}{8}$d. Farram, $0\frac{1}{1}\frac{5}{6}$d. Ana, 1⅛d. Siano, 1s. 6¾d. Rupee, 2s. 6d. French crown, 5s. English crown, 5s. Pagoda, 8s. 9d. A lac is 100,000 rupees, silver. A crore of rupees, silver, is 100 lacs.

BERNE, AARGAU, BASEL, FREYBERG, SOLOTHURN.

10 Rappen or 4 Kreutzers, or 3 French Sous = 1 Batz, 1½d. 10 Batz, 1 Swiss Franc, or Livre, 1s. 2½d. 15 Batzen, 1 Florin, 1s. 10½d. 16 Swiss Francs, 1 Louis neuf of 24 Livres tournois de France, 18s. 8½d. Crown of Basel, silver, 4s. Double Helvetic Sequin, 19s. 9d. Florin of Basel, gold, 6s. 7¾d. Sequin of Basel, gold, 8s. 4½d. Double Sequin of Basel, 1795, gold, 19s. 8½d. Double Sequin of Solothurn, gold, 19s. 8½d. Sequin, gold, 9s. 8½d. Double Sequin of Berne, 1782, gold, 19s. 4½d. 6 Sequin piece, of Berne, gold, £3 17s. 5½d.

The value of the coin varies much in the various cantons.

The Louis neuf of 24 livres tournois de France, is reckoned as worth intrinsically 18s. 8⅛d., or 23 francs; therefore, in transactions this should be borne in mind, for the accustomed valuation is £1 English.

BRABANT.

Penning, $0\frac{0}{1}\frac{}{0}$d. Urche, $0\frac{0}{4}\frac{}{0}$d. Grote, *a*, $0\frac{0}{2}\frac{}{0}$d. Petard, $0\frac{0}{1}\frac{}{0}$d. Scalin, *a*, $5\frac{4}{1}\frac{}{0}$d. Scalin, $6\frac{3}{1}\frac{}{0}$d. Florin, 1s. 6d. Ducat, 9s. 2½d. Pound Flemish, 9s.

Accounts are kept in French francs and centimes, which are current.

BRANDENBERG.

Denier, $0\frac{7}{2}\frac{}{0}$d. Polchen, $0\frac{7}{3}\frac{}{0}$d. Gross, $0\frac{7}{1}\frac{}{5}$d. Abrass, $0\frac{7}{1}\frac{}{0}$d. Mark, *a*, 9½d. Florin, 1s. 2d. Rix dollar, 3s. 6d. Albertus, 4s. $2\frac{2}{5}$d. Ducat, 9s. 4d.

BRUNSWICK.

Penning, $0\frac{1}{1}\frac{9}{6}\frac{9}{0}$d. A Mary Groschen, $1\frac{1}{1}\frac{1}{8}$d. A good groschen, $1\frac{7}{1}\frac{7}{9}$d. Rix dollar = 24 good, or 36 Mary groschen, or 360 pennings, or 3s. 2d.

The new dollar is equal to the Prussian thaler; the ducat worth 3 rix dollars, 10 groschen; gold pieces, worth $2\frac{1}{2}$ dollars; and whole, half, and quarter conventional dollars, worth 48, 24, and 12 Mary groschen, also circulate.

CHINA.

Caxa, $0\frac{2}{2}\frac{2}{5}$d. Candareen, $0\frac{4}{5}$d. Mace, 8d. Rupee, 2s. 4d. Dollar, 4s. 8d. Rix dollar, 4s. 8d. Crown, 4s. 8d. Tale, 6s. 8d.

DENMARK.

Schilling, nearly $\frac{1}{4}$d. Duggen, 3d. Mark of 16 schillings, 1776, $7\frac{1}{2}$d. Rix marc, $9\frac{1}{4}$d. Rix ort, $11\frac{1}{4}$d. Crown of 4 marc, 2s. 6d. Rix dollar, or piece of 6 Danish marcs of 1750, 4s. Rix dollar, or double crown of 96 Danish schillings of 1776, 4s. 6d. Ducat, current since 1767, 7s. 6d. Ducat, specie, 1791 to 1802, 9s. $4\frac{3}{4}$d. Christian, 1783, gold, 16s. 7d.

ST. DOMINGO.

2 Half sols, 1 sol, *a*, $0\frac{1}{3}\frac{1}{2}\frac{7}{0}$d. Half scalin, $2\frac{9}{1}\frac{2}{2}\frac{5}{8}$d. Scalin, $5\frac{6}{1}\frac{6}{8}$d. Livre, *a*, $7\frac{6}{1}\frac{6}{8}$d. Dollar, 4s. $4\frac{3}{1}\frac{3}{6}$d. Ecu, 4s. 10d. Pistole, 15s. $10\frac{3}{8}$d. Louis d'or, 19s. 6d.

FRANCE.

Copper: Centime, the 100th part of a franc; sou, 20th part of a franc; 2 sous, gross sou, or decime, 10th part of a franc = $\frac{3}{4}$-80th of an English penny. Copper and silver, called billion, or monaie grise: 4 Liards = 1 sou; 6 liards = $1\frac{1}{2}$ sou; pieces of 6 blanc = $2\frac{1}{2}$ sous. Silver: Quarter franc, or 25 centimes, $2\frac{1}{2}$d. Half franc, or 50 centimes, $4\frac{3}{4}$d. Franc, or 100 centimes, $9\frac{1}{2}$d. 2 Franc piece, 1s. 7d. 5 Franc piece, 4s. Gold: 20 Franc, or Napoleon, 15s. $10\frac{1}{2}$d. 40 Franc, or double Napoleon, £1 11s. $8\frac{1}{2}$d. 80 Francs = 81 Livres tournois.

All accounts are kept in francs and centimes, but the other coins are used in business. Travellers usually calculate the sou at a $\frac{1}{2}$d. and a franc at 10d. English. An English sovereign, in comparison to a 20 franc piece, from its superior pureness of gold, is as 7 to 5. The intrinsic value of the sovereign is 25 francs 20 centimes. The rate of exchange at Paris and the principal towns is usually 25 francs 50 centimes for 1 sovereign, and in smaller towns 25 francs 75 centimes. It is common, for convenience, to reckon 25 francs as equal to 20s.; thus, 100 francs = 80 shillings, £4 English; and £5 English = 125 francs. An English crown is worth 6 francs 25 centimes; a shilling, 1 franc 25 centimes; a penny, nearly 10 centimes.

5 Francs in copper weigh
50 ——— in bullion weigh
200 ——— in silver weigh
3,100 ——— in gold weigh
} 1 killogramme.

Hence, 1 franc = 5 grammes, and any other pieces in the above proportion.

GENOA.

French coin circulates. The copper coins are pieces of 8, 4, and 2 denarii. Parpajole, base silver, $0\frac{3}{4}$d. Parpajole, double, $1\frac{1}{2}$d. 6 Soldi, 8 denarii piece, $7\frac{1}{2}$d. Half madonnina of 10 soldi, silver, 4d. 1 Madonnina, 8d. 1 Madonnina, double, 1s. 4d. Scudo of 2 lire, 1s. 4d. Scudo of 8 lire, 5s. 4d. Genovina, 6s. Genovina, or scudo 9 lire 10 soldi, 6s. 4d. $\frac{1}{8}$ Genovina, 12 lire, gold, 8s. Quarter genovina, gold, 16s. Half genovina, £1 13s. 4d. Half genovina, new, or 2 pistoles, £1 12s. 1 Genovina, 100 lire, £3 6s. 8d. 1 Genovina new, or 4 pistoles, £3 4s. Zecchino, or sequin, 9s. $6\frac{1}{4}$d. Doppia, or pistole, 16s.

Accounts are kept in lire of 20 soldi, each soldo being divided into 12 denarii. The lire is worth about $7\frac{1}{2}$d. or 8d.

HAMBURG.

Schilling, currency, $0\frac{3}{4}$d. Schilling, banco, 1d. Mark, 1s. 16 Schilling piece, convention, 1s. $2\frac{1}{2}$d. Marc, banco, *a*, 1s. $5\frac{3}{4}$d. Rix dollar, specie, 4s. 7d. New Town ducat, gold, 9s. 4d. Ducat ad legem imperii. 9s. $4\frac{3}{4}$d.

HOLLAND AND BELGIUM.

100 centimes = 1 florin. 20 Stivers = 1 florin, or guilder. Sou, 1d. Escalin, silver, 6d. Florin, 1s. $8\frac{1}{4}$d. Ducat, or rix dollar, 1s. 4d. Ducaton, or ryder, 5s. 5d. Ducat, gold, 9s. $5\frac{3}{4}$d. 10 Williams, 1818, 16s. $5\frac{1}{2}$d. 10 Florins, 17s. $1\frac{3}{4}$d. 20 Florins, 1808, £1 14s. $2\frac{3}{4}$d. Ryder, £1 5s. $1\frac{1}{4}$d.

JAPAN.

Piti, $0\frac{6}{3}\frac{3}{2}\frac{3}{5}$d. Mace, $3\frac{5}{8}\frac{7}{5}$d. Tigo-gin, of 40 Mas, silver, 11s. 5d. Half ditto, 5s. $8\frac{1}{4}$d. One-fourth, ditto, 2s. $10\frac{1}{2}$d. One-eighth ditto, 1s. 5d. Half Kobang, gold, 12s. $10\frac{1}{2}$d. New ditto, £1 5s. 11d. Old Kobang of 100 Mas, £2 3s. 7d. Half Old ditto, £1 3s. $7\frac{1}{2}$d.

LIVONIA.

Blacken, $0\frac{7}{9}$d. Grosh, $0\frac{7}{1}$d. Vorden, $0\frac{7}{1}\frac{}{0}$d. Whitin, $\frac{1}{1}\frac{1}{8}$ parts of 1d. English. Marc, $2\frac{1}{3}$d. Florin, 1s. 2d. Rix Dollar, 3s. 6d. Albertus, 4s. $2\frac{6}{1}\frac{}{5}$d. Copperplate Dollar, 5s.

LOMBARDO.—VENETIAN.

Livre (Austrian), $8\frac{1}{4}$d. Florin, or Half Crown, 2s. $0\frac{3}{4}$d. Crown, 4s. $1\frac{1}{2}$d. Half Sovereign, gold, 13s. $6\frac{1}{4}$d. Sovereign, 1823, £1 7s. 1d.

LUCCA.

The Florentine coins circulate. The copper coins are Bolognini, Soldi, and Quattrini. Quarter barbone of 3 soldi, silver, 1d. Half barbone, 2d. 1 Barbone, 4d. One-fifth scudo, $10\frac{1}{2}$d. One-third scudo, 1s. $5\frac{1}{2}$d. Half scudo, 2s. 1d. Scudo, 4s. 4d. Pistole, gold, 13s. 9d.

Accounts are kept in Lire of 20 soldi, or 240 Denari. The Lire is sometimes divided into 10 bajocchi or bolognini.

MILAN.

The copper coins are denarii. $1\frac{1}{2}$ Denarii. 3 Denarii pieces. Also, soldo, and half soldo. The base silver coin is about in value:—Piece of 5 soldi, $1\frac{3}{4}$d.

Half lira of 10 soldi, 3¾d. Lira, 20 soldi, silver, 7½d. Piece of 30 soldi, silver, 11d. Half scudo of 3 lire, silver, 1s. 10½d. Scudore of 6 lire, 3s. 9d. Filippo of 7 lire, 10 soldi, 4s. 9d. Ducatone of 8 lire, 12 soldi, 5s. 5d. Zecchino, or sequin of 15 lire 1 soldi, 9s. 5½d. Pistole, or Doppia of 25 lire 3 soldi, 15s. 8½d.

At Milan accounts are kept in Italian lire and centimes. The lira is worth 7d. or 7½d.; it is divided into 20 soldo, each soldo consisting of 5 centimes.

NAPLES.

The copper coins are pieces worth 5, 4, 3, 2, and 1 grani, and tornessi, or half grani.—Quarter carlino, 2½ grani, silver 1c. Half carlino, 5 grani, 2d. Carlino of 10 grani, 1804, 4d. Piece of 12 grani, 4¾d. Piece of 13 grani, 5¼d. Tari of 2 carlino, 20 grani, 1804, 8d. Piece of 24 grani, 9½d. Piece of 26 grani, 11d. Piece of 3 carlini, 1s. Piece of 4 carlini, 1s. 4¼d. Pacata or half ducato, 5 carlini, 1s. 8½d. Half scudo of 6 carlini, 2s. 0½d. Ducato of 10 carlini, 3s. 4½d. Scudo or Piastre of 12 carlini, 4s. 1½d. Piece of 13 carlini, 4s. 5d. New ounce of 3 ducati, gold, 10s. 5¾d. The pieces of ducati are numerous.

Accounts are kept in ducati, divided into 10 carlini, these into 10 grani, or 5 tari, and these into 10 calli. Spanish dollars are worth 10 carlini. Napoleons, about 47 carlini, and old Louis-d'ors, about 55 carlini. Cedule of 5, 6, and 7 scudi of the Monte de Pietá, and the bank of St. Spirito, also circulate. The Roman scudo is worth 12½ carlini; the sequin, 25½ carlini.

PARMA, PLACENTIA, &c.

5 Soldi piece, base silver, 0½d. 10 Soldi piece, ditto, 1d. 1 Lira, or 20 soldi, nearly 2½d. 3 Lire piece, silver, 6½d. Testone, 6 lire 6 soldi, 1s. 2d. Scudo, 8 lire 8 soldi, 1s. 7d. Ducatone, of 21 lire, 3s. 11½d. Ducatone of 1784, 4s. 1½d. Sequin, of 45 lire, gold, 8s. 5½d. Zecchino, gold, 9s. 5⅝d. Doppia, or pistole, 72 lire 12 soldi, 13s. 7½d. Doppia, or pistole of 1786, 17s. 4½d. Doppia, or pistole of 1784, 18s. 3d. 20 Lire, Maria Louisa, 1815, 15s. 10½d. 40 Lire, Maria Louisa, 1815, £1 11s. 9d.

Accounts are kept in lire of 20 soldi, or 240 denarii, also in Italian lire of 100 centesimi. The Louis-d'or is worth about 97 lire.

PERSIA.

Coz, 0⅜d. Bisti, 1⅜d. Mamoudi, silver, 4½d. Abassi, 9d. Larin, 9½d. Rupee, 1s. 11½d. Rupee, double, 3s. 10½d. Half rupee, gold, 14s. 6¾d. Rupee, gold, £1 9s. 1¾d.

PIEDMONT, TURIN, NICE, &c.

The copper coins are pieces of 1 soldi, and quatrini, consisting of 3 denarii. 2½ Soldi piece, base silver, 1¼d. 7½ Soldi piece, 4d. One-eighth of Scudo of 15 soldi, silver, 8¼d. Quarter scudo of 1½ lire, 1s. 4¾d. 2 Lire piece, 1s. 10½d. Half scudo of 3 lire, 2s. 9½d. 1 Scudo, new, of 5 lire, 1816, 3s. 11½d. Scudo of 6 lire, since 1755, 5s. 7½d. Half zecchino, or sequin, gold, 4s. 8d. Quarter doppia, or pistole, 5s. 7½d. Zecchino, or sequin, 9s. 5¾d. Zecchino of Genoa, 9s. 6¼d. Half new pistole, 10s. 10¾d. Marengo, or 20 franc piece, 14s. 7d. New pistole of 20 lire, 1816, 15s. 10d. Double new pistole of 24 lire, £1 3s. 9½d. Quarter carlino of 30 lire, *£1 8s.* 1½d. Half carlino, since 1755, £2 19s. 6d. Carlino, £5 19s.

POLAND.

Shelon, $0\frac{7}{8}$d. Grosh $\frac{7}{8}$ part of a penny English. Caustic, $2\frac{1}{2}$d. Tinse, 7d. Ort, $8\frac{1}{2}$d. Florin, 1s. 2d. Rix dollar, 3s. 6d. Ducat, 9s. 4d. Frederic d'or, 17s. 6d.

PORTUGAL.

Re, *a*, $\frac{2}{4}\frac{7}{0}$ the half vinten—$\frac{2}{4}\frac{7}{0}$ parts of a penny English. Vinten, $1\frac{7}{8}$d. Testoon, silver, $6\frac{3}{4}$d. New cruzada, of 480 reis, silver, 4s. 11d. Cruzada of 480 reis, gold, 2s. $7\frac{1}{4}$d. 8 Testoon piece, 800 reis, 4s. $5\frac{3}{4}$d. 12 Testoon piece, 1200 reis, 6s. $4\frac{1}{4}$d. 16 Testoon piece, 1600 reis, 8s. $11\frac{1}{4}$d. Half Portuguese piece, or moiadobra, 3200 reis, 17s. $10\frac{1}{2}$d. 1 Portuguese piece, or moiadobra, 6400 reis, £1 15s. 10d. Quarter lisbonina, or moidore, 1200 reis, 6s. $8\frac{3}{4}$d. Half lisbonina, or moidore, 2400 reis, 13s. $5\frac{1}{2}$d. 1 Lisbonina, or moidore, 4800 reis, £1 6s. $11\frac{1}{4}$d.

PRUSSIA.

The pfenning is $\frac{1}{1}\frac{1}{0}$, and the gröschel $\frac{2}{1}\frac{1}{0}$ of a penny English. Silver groschen, $0\frac{3}{4}$d. Guter groschen, $1\frac{1}{2}$d. 5 silver groschen piece, $5\frac{3}{4}$d. Currency dollar (courant thaler) = 24 good, or 30 silver groschen, or 360 pfennings, nearly, 2s. $11\frac{1}{4}$d. Half Frederic, gold, 8s. 3d. 1 Frederic, 16s. 6d. Ducat, 9s. 4d. Paper money down to a thaler.

ROME, BOLOGNA, &c.

The copper coins are the bajoccho, the half bajoccho, and the quatrino. The base silver is: Bajocchello, of 2 bajocchi, 1d. Bajocchello, double, 2d. Carlino of $7\frac{1}{2}$ bajocchi, $3\frac{3}{4}$d. Carlino, double, $7\frac{3}{4}$d. Piece of $2\frac{1}{2}$ bajocchi, silver, $1\frac{1}{4}$d. Half paolo, or piece of 5 bajocchi, $2\frac{1}{2}$d. Paolo, or 10 bajocchi, $5\frac{1}{2}$d. Papetto of 2 paoli, $10\frac{1}{2}$d. Testone of 3 paoli, 1s. $3\frac{3}{4}$d. Half scudo of 5 paoli, 2s. $1\frac{3}{4}$d. Scudo Romano of 10 paoli, 4s. $3\frac{1}{2}$d. Half zecchino, gold, 4s. $8\frac{1}{4}$d. Half doppia, or pistole, 6s. $11\frac{1}{2}$d. Zecchino, or sequin, 9s. $4\frac{1}{2}$d. Doppia, or pistole, paoli 6 or 8, 13s. $11\frac{1}{4}$d. Double zecchino, 18s. 9d.

RUSSIA.

The value of money of the same denomination varies much; there is also great difference in the value of paper money and coins of the same name. The following is the principal coinage in use: Ruble of 100 copecks, 1763 to 1807, silver, 3s. 2d. Ruble of 1750 to 1762, 3s. $7\frac{3}{4}$d. Half imperial, since 1763, 10 rubles, gold, 16s. $4\frac{1}{2}$d. 1 Imperial, since 1763, £1 12s. 9d. Half imperial, from 1755 to 1763, 10 rubles, £1 0s. $9\frac{1}{4}$d. Imperial, from 1755 to 1763, £2 1s. $6\frac{1}{2}$d. Ducat, of 1763, 9s. $2\frac{1}{4}$d. Ducat, from 1755 to 1763, 9s. $4\frac{1}{4}$d.

SARDINIA.

The copper coins are half soldi, cagliaresi, and denarii. Half real, base silver, $2\frac{1}{2}$d. Real, $4\frac{1}{2}$d. Quarter scudo, $11\frac{1}{2}$d. Half scudo, 1s. $10\frac{1}{4}$d. Scudo since 1768, 3s. $8\frac{3}{4}$d. Scudo, 1816, 3s. $11\frac{1}{4}$d. Doppietta, or gold scudo, 7s. $8\frac{1}{2}$d. Half pistole, 11s. $3\frac{1}{4}$d. Pistole, £1 2s. $6\frac{1}{2}$d. Half carlino, 19s. $6\frac{3}{4}$d. Carlino, since 1768, £1 19s. $1\frac{1}{2}$d.

SICILY.

Neapolitan coins are current. Half carlino, 5 grani, $1\frac{1}{1}\frac{1}{6}$d. 1 Carlino, 10 grani, $2\frac{3}{8}$d. Taro, $4\frac{1}{2}$d. Scudo of 12 Tari, 4s. $0\frac{1}{2}$d. Onza of 3 ducati, or 30 Tari, 1785, 10s. $10\frac{1}{2}$d. Onza, double, £1 1s. $8\frac{1}{2}$d.

SPAIN.

Reallillo, $\frac{1}{20}$ piastre (Peninsula), silver, 2½d. Real of 1, or half peseta, $\frac{1}{10}$ piastre, silver, 5½d. Real of 2, or peseta, $\frac{1}{5}$ piastre, 10½d. Piastre, since 1772, 4s. 2¾d. Half pistole, or crown, gold, 8s. 1d. Doubloon, 2 crowns, 16s. 2d. Doubloon, 4 crowns, £1 12s. 4d. Doubloon, 8 crowns, £3 4s. 8d. Half pistole or crown, 1772 to 1786, 8s. 3¾d. Doubloon, or 2 crowns, 1772 to 1786, 16s. 7¾d. Doubloon, or 4 crowns, ditto, £1 13s. 3½d. Doubloon, or 8 crowns, ditto, £3 6s. 7d.

SWITZERLAND.

1 Franken piece, 1s. 2½d. 2 Franken piece of Switzerland, 1803, 2s. 4½d. 4 Franken piece of Switzerland, 1803, 4s. 9d. 4 Franken piece of Berne, 1799, 4s. 8d. Crown, of 40 batz, Basle and Soleure, since 1798, 4s. 8d. Half crown, or florin, since 1781, 1s. 10½d. 1 Crown of Zurich, of 1781, 3s. 8½d. Franken of Berne, since 1803, 1s. 2½d. Half crown, or florin of Basle, 1s. 9½d. 1 Crown, 30 Batz, or 2 florins, 3s. 7½d. Pistole of Berne, gold, 18s. 10d. Ducat of Berne, gold, 9s. 2¾d. Ducat of Zurich, 9s. 5d. 16 Franken piece, 18s. 10½d. 32 Franken piece, £1 17s. 9d.

TURKEY.

The small coins are the mangar, 4 of which are an aspre, 3 aspres are 1 para, and 40 paras 1 piastre; there are also coins called the bestic, ostic, and solota. Aspres, 120 to the piastre, are silver: rouble of 10 paras, or 30 aspres, 4½d. Yaremlec of 20 paras, or 60 aspres, 9½d. Piastre of 40 paras, 1s. 7d. Altmichlec of 60 paras, since 1771, 2s 9½d. 5 Piastre piece, 3s. 3½d. Zechin zermahboub Selim III., 5s. 9½d. Half zechin zermahboub, Selim III., gold, 2s. 4¾d Quarter zechin zermahboub, 1s. 2½d. 1 Zechin zermahboub, Hamet 1774, 6s. 11d. Half zechin zermahboub, ditto, 3s. 5½d. Roubbie, or quarter zechin fondoukli, 1s. 11d.

TUSCANY, FLORENCE, LEGHORN, PISA, &c.

The copper coins are soldi, two-thirds of a soldo, and quatrini, one-third of a soldo. Crazia, base silver, 0¾d. Quarter paolo, 1½d. Half paolo, silver, 2½d. Paolo, 5d. Lira, of 20 soldi, 9d. 2 Paolo piece, 10d. Quarter tallaro of 1½ lire, 1s. 1½d. 3 Paolo piece, 1s. 3d. Half tallaro of 3 lire, 2s. 3d. Franceschino, or Leopoldino 5 paolo, 2s. 2½d. Tallaro of 6 lire, 4s. 6d. Francescone, or Leopoldo, or scudo of 10 paoli, 4s. 5½d. Half Rosina, 8s. 6½d. 1 Rosini, 17s. 1d. Zecchino, with effigy, 9s. 6½d. Half zecchino, with effigy, 4s. 9d. One-third Ruspone, or zecchino, 9s. 6½d. 1 Ruspone, or 3 zecchino, lily, £1 8s. 7d.

FOREIGN EXCHANGES BY THE CHAIN RULE.

The chain rule, or rule of equations, is used in calculating exchanges, and saves the continued statings required by the Double Rule of Three.

RULE.—Reduce all the quantities of the same kind to the same name. Change all numbers of *unequal* kinds into fractions. Let x express

the required quantity, and to the right of it place, as consequent, the term to which it is equivalent; then below x as *antecedent*, the other given term which is of the same kind as the last *consequent*, and to the right of it the term which is equivalent to it; next, multiply the consequents or right hand terms together for a product, and divide it by the product of the multiplication of the antecedents or left hand terms, and the quotient will be the result.

EXAMPLE.

1.—What will an estate, worth £39420 per annum amount to in a minute?

x	1 minute.	Year, 1	£39420.
Minutes, 60	1 hour.	£1	20s.
Hours, 24	1 day.	1s.	12d.
Days, 365	1 year.		

$365 \times 24 \times 60 = 525600 \div £39420 = 1s.\ 6d.$ per minute.

AMSTERDAM.

16 Pfennings = 1 stiver; 20 stivers = 1 guilder or florin; 2½ florins = 1 rix dollar; 6 florins = 1 pound (Flemish) 100 cents = 1 florin.

EXAMPLE.

2.—What is the exchange of £500 sterling in florins and stivers, at 12 florins 3 stivers, per pound sterling?

x	£500.
£1	12 florins 3 stivers.

$500 \times 12{\cdot}3 = 6075$ florins.

HAMBURGH.

12 Pfennings = 1 schilling; 12 schillings = 1 mark; 2 marks = 1 dollar; 3 marks = 1 rix dollar.

NOTE.—There are two kinds of money at Hamburg, banco and currency; banco is the same as Flemish.

6 Pfennings = 1 groat or penny; 12 pence = 1 schilling; 20 schillings = 1 pound.

EXAMPLE.

3.—Exchange £620 10s. sterling into marks, banco at 13 m. 8 sc. per £.?

x	£620½.
2 = 1	13 m. 8 sc.

$1241 \times 13{\cdot}8 \div 2 = 8376$ marks 12 sch.

PARIS.

10 mils = 1 centime; 10 centimes = 1 décime; 10 décimes = 1 franc.

EXAMPLE.

4.—Exchange £700 into francs and cents, at 25f. 20c. per £. sterling?

x ... ... £700.
£1 ... ... 25 francs 20 cents.

700 × 25·20 = 17640 francs.

A new plan of bringing French Coins to British Money, and British to French.

RULE.—Cut off two figures to the right in the francs; multiply the figures to the left by 4, and the product will be pounds sterling; 25 francs make a pound, and 10d. a franc, so the figures to the right will count so much of a pound. Bring the British to French by dividing by 4, adding 2 ciphers to the quotient for francs.

EXAMPLES.

5.—In 2500 francs how many pounds? × 25,00 by 4 = £100. Ans.

6.—In £240 how many francs? ÷ 4) £240 = 6000f. Ans.

GENOA.

100 Centesima = 1 lira nuova.

EXAMPLE.

7.—Exchange £620 10s. sterling into lira, nuova, and centis, at 25l. 35c. per £.?

x ... ... £620½.
£1 ... ... 25l. 35c.

620½ × 25·35 = 15729 l. 67 c.

BERLIN.

30 Silver groschen = 1 Prussian dollar.

EXAMPLE.

8.—Exchange £400 sterling into Prussian dollars, at 6 dol. 26 s. g. per £.?

x £400
£1... ... ... 6 dol 26 s. g.

400 × 6·26 = P. dol., 2746, 20 s. g.

MILAN.

4 Denarii = 1 soldo; 20 soldi Austriachi = 1 lira Austriachi; 100 centisimi = 1 lira Austriachi.

EXAMPLE.

9.—Exchange £340 10s. sterling into lira Austriachi, at 29 l. 50 c. per £.?

x ... ... £340½.
2 = £1 ... ... 29 l. 50 c.

681 × 29·50 ÷ 2 = 10044 l. 75 c.

LEGHORN.

5 Centisimi = 1 soldo di lira; 20 soldo di lira = 1 lira Toscano; 100 centesimi = 1 ditto.

EXAMPLE.

10.—Exchange £675 12s. 6d. sterling into lira and centesima, at 30 l. 69 c. per £.?

x ... ... £675½ = 5405.
8 = £1 ... ... 30 l. 96 c.

5405 × 30·69 ÷ 8 = 20734 l. 93 c.

LISBON.

400 Rees = 1 crusado; 1000 rees = 1 milree; 1000 milrees = 1 conto of rees; 4800 rees = 1 moidore: 2½ crusados = 1 millree.

EXAMPLE.

11.—Exchange £420 10s. sterling into contos of rees, millrees, and rees, at 56½d. per milree?

x ... ... £420½ = 841.
£1 ... ... 240d.
56½d. = 1 m. ... ... 1000 rees.

841 × 240 × 1000 ÷ 113 = 1 r. 786 m. 460 r.

GIBRALTAR.

16 Quartos = 1 real; 12 reals = 1 dollar.

EXAMPLE.

12.—Exchange £750 12s. 6d. sterling into Spanish hard dollar, at 51d. per dollar?

x ... ... 750½ = 6005.
£1 ... ... 240d.
408 = 51 ... ... 1 hard dollar.

6005 × 240 ÷ 408 = 3532 h. d. 4 r. 16 qr.

NAPLES.

10 Grani = 1 carlino; 20 grani = 1 taro; 5 tari, or 10 carlini = 1 ducat; 100 grani = 1 ducat.

EXAMPLE.

13.—Exchange £300 sterling into Neapolitan ducats, at 40d. per ducat?

x £300
£1 ... ... 240d.
40d. ... ... 1 ducat.

300 × 240 ÷ 40 = 1800 ducats.

ST. PETERSBURGH.

One hundred copecks = one ruble.

EXAMPLE.

14.—Exchange £500 sterling into silver rubles, at 37d. per silver ruble?

x	£500
£1	240d.
37d.	1 s. ruble.

500 × 240 ÷ 27 = 3243 s. r. 24 copecks.

NEW YORK.*

10 Dollars = 1 eagle; 10 dimes = 1 dollar; 10 cents = 1 dime; 10 mils = 1 cent.

EXAMPLE.

15.—Exchange £500 into dollars and cents, at a premiun of 10 per cent?

x	£500
£9	40 dollars.
100 dollars	110 dols. with prem.

500 × 40 × 110 ÷ 900 = 2440 dols. 44 cents.

EVERY SPIRIT MERCHANT HIS OWN GAUGER.

TO GUAGE CASKS BY THE SLIDE RULE.

Casks are divided into four varieties.

First find a mean diameter. If the difference between the head and bung diameters do not exceed 6 inches, the diameter is found by multiplying the difference of the first by 68, the second by 62, the third by 55, the fourth by 5. The respective products of these numbers added to the head diameter will give a mean diameter.

* In the United States, the dollar is usually valued at 4s. 6d., allowing 40 dollars for £9 sterling, or 444 dollars 44 cents for £100. But by an act of Congress lately passed, the custom-house values the £ sterling at 4 dollars 8 cents, which is 4s. 2d. per dollar, and is equal to a premium of 8 per cent on the fixed premium of 4s. 6d. per dollar. *The value of* the half-eagle is 22s. 6d.

1.—In a cask of the first variety, head diameter 24, bung 28, and length 30 inches, how many imperial gallons will it contain? Set 30 upon B to the gauge point 353 upon A, and against 26·72 (the mean diameter) upon D, are 60·7 imperial gallons, the answer upon C.

2.—How many imperial gallons are contained in a cask of the second variety, head diameter 18, bung diameter 23, and length 28 inches? Set 28 upon B to the gauge point 353 upon A, and against 21·1 (the mean diameter) upon D, are 35·3 imperial gallons, the answer upon C.

3.—If a cask of the third variety is 20 inches at the head, 26 at the bung, and 29 inches long, what are the contents in imperial gallons? Set 29 upon B to the gauge point 353 upon A, and against 23·3 (the mean diameter) upon C, are 44·6 imperial gallons, the content upon C.

4.—A cask of the fourth variety, 34 inches long, head 26, and bung 32, how many imperial gallons will it hold? Set 34 upon B to the gauge point 353 upon A, and against 29 (the mean diameter) upon D, are 81 imperial gallons, the answer upon C.

The following tables will show, at one view, the quantity of liquor in casks or puncheons, to the tenth of a gallon from 10 to 120 gallons, which can be ascertained by dipping with a *common inch rule* into either keg or puncheon, when lying on the side or standing on the end.

Observe.—If the cask be lying on the side, dip the rule into the bung-hole; count the wet inches; look to the table for the number required, and opposite, in the next column, you will find the number of gallons and tenths. The third column shows the content if the cask be standing.

TEN GALLONS. 12-inch Bung.			FIFTEEN GALLONS. 14-inch bung.			TWENTY GALLONS. 17-inch Bung.		
In.	G. 10ths.	Altde.	In.	G. 10ths.	Altde.	In.	G. 10ths.	Altde.
1 is...	0 · 4 is...	0 · 7	1 is...	0 · 4 is...	0 · 7	1 is...	0 · 3 is...	0 · 7
2 ...	0 · 9 ...	1 · 4	2 ...	1 · 2 ...	1 · 3	2 ...	1 · 2 ...	1 · 3
3 ...	1 · 6 ...	2 · 2	3 ...	2 · 0 ...	2 · 1	3 ...	2 · 0 ...	2 · 5
4 ...	2 · 6 ...	2 · 9	4 ...	3 · 2 ...	3 · 0	4 ...	3 · 2 ...	3 · 6
5 ...	3 · 5 ...	3 · 6	5 ...	4 · 5 ...	3 · 7	5 ...	4 · 5 ...	4 · 5
6 ...	5 · 0 ...	4 · 4	6 ...	6 · 0 ...	4 · 6	6 ...	6 · 0 ...	5 · 5
7 ...	5 · 5 ...	5 · 0	7 ...	7 · 5 ...	5 · 5	7 ...	7 · 5 ...	6 · 6
8 ...	6 · 4 ...	5 · 8	8 ...	9 · 0 ...	6 · 4	8 ...	9 · 1 ...	7 · 6
9 ...	7 · 4 ...	6 · 6	9 ...	10 · 0 ...	7 · 5	9 ...	10 · 7 ...	8 · 7
10 ...	8 · 3 ...	7 · 3	10 ...	11 · 8 ...	8 · 4	10 ...	12 · 3 ...	10 · 0
11 ...	9 · 6 ...	8 · 0	11 ...	12 · 9 ...	9 · 3	11 ...	14 · 0 ...	11 · 1
12 ...	10 · 0 ...	8 · 8	12 ...	13 · 8 ...	10 · 2	12 ...	15 · 2 ...	12 · 2

TWENTY-ONE GALLONS.

18-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 5 is...	0 · 7
2 ...	1 · 9 ...	1 · 2
3 ...	2 · 7 ...	2 · 0
4 ...	3 · 9 ...	3 · 0
5 ...	4 · 6 ...	4 · 0
6 ...	6 · 0 ...	5 · 1
7 ...	7 · 0 ...	6 · 2
8 ...	8 · 8 ...	7 · 3
9 ...	10 · 5 ...	8 · 4
10 ...	12 · 0 ...	9 · 5
11 ...	13 · 4 ...	10 · 5
12 ...	14 · 6 ...	11 · 5

FORTY-TWO GALLONS.

24-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 5 is...	1 · 2
2 ...	1 · 5 ...	2 · 4
3 ...	3 · 2 ...	3 · 8
4 ...	4 · 7 ...	5 · 2
5 ...	6 · 4 ...	6 · 7
6 ...	8 · 2 ...	8 · 2
7 ...	10 · 1 ...	9 · 8
8 ...	12 · 0 ...	11 · 5
9 ...	14 · 1 ...	13 · 2
10 ...	16 · 5 ...	15 · 1
11 ...	18 · 8 ...	17 · 0
12 ...	21 · 0 ...	19 · 0

SIXTY GALLONS.

26-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 8 is...	1 · 4
2 ...	2 · 2 ...	3 · 0
3 ...	4 · 0 ...	4 · 5
4 ...	5 · 6 ...	6 · 2
5 ...	7 · 9 ...	7 · 9
6 ...	10 · 4 ...	9 · 7
7 ...	13 · 1 ...	11 · 5
8 ...	15 · 8 ...	13 · 4
9 ...	18 · 7 ...	15 · 4
10 ...	20 · 9 ...	17 · 4
11 ...	23 · 9 ...	19 · 5
12 ...	26 · 9 ...	21 · 7

THIRTY-THREE GALLONS.

21-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 6 is...	1 · 0
2 ...	1 · 7 ...	2 · 0
3 ...	3 · 1 ...	3 · 1
4 ...	4 · 3 ...	4 · 3
5 ...	6 · 0 ...	5 · 5
6 ...	7 · 9 ...	6 · 7
7 ...	9 · 4 ...	8 · 0
8 ...	11 · 5 ...	9 · 4
9 ...	13 · 5 ...	11 · 0
10 ...	15 · 6 ...	12 · 5
11 ...	17 · 3 ...	14 · 0
12 ...	19 · 5 ...	15 · 6

FORTY-FOUR GALLONS.

24-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 5 is ..	1 · 1
2 ...	1 · 9 ...	2 · 3
3 ...	3 · 3 ...	3 · 6
4 ...	4 · 9 ...	5 · 0
5 ...	6 · 7 ...	6 · 5
6 ...	8 · 6 ...	8 · 1
7 ...	10 · 5 ...	9 · 8
8 ...	12 · 6 ...	11 · 5
9 ...	14 · 8 ...	13 · 5
10 ...	16 · 9 ...	15 · 4
11 ...	19 · 2 ...	17 · 5
12 ...	22 · 0 ...	19 · 6

SIXTY-THREE GALLONS.

26-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 8 is...	1 · 5
2 ...	2 · 3 ...	3 · 1
3 ...	4 · 2 ...	4 · 8
4 ...	5 · 9 ...	6 · 6
5 ...	8 · 3 ...	8 · 4
6 ...	10 · 9 ...	10 · 2
7 ...	13 · 7 ...	12 · 2
8 ...	16 · 6 ...	14 · 2
9 ...	19 · 6 ...	16 · 2
10 ...	21 · 9 ...	18 · 4
11 ...	25 · 1 ...	20 · 6
12 ...	28 · 2 ...	22 · 9

THIRTY-SIX GALLONS.

22-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 6 is...	1 · 1
2 ...	1 · 6 ...	2 · 3
3 ...	3 · 0 ...	3 · 5
4 ...	4 · 4 ...	4 · 7
5 ...	6 · 2 ...	6 · 1
6 ...	7 · 8 ...	7 · 5
7 ...	9 · 9 ...	8 · 9
8 ...	11 · 6 ...	10 · 4
9 ...	13 · 8 ...	11 · 9
10 ...	15 · 7 ...	13 · 5
11 ...	18 · 0 ...	15 · 2
12 ...	20 · 3 ...	17 · 0

FIFTY-FOUR GALLONS.

26-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 8 is...	1 · 3
2 ...	1 · 9 ...	2 · 7
3 ...	3 · 0 ...	4 · 3
4 ...	4 · 6 ...	5 · 7
5 ...	6 · 3 ...	7 · 4
6 ...	8 · 2 ...	9 · 8
7 ...	10 · 4 ...	11 · 0
8 ...	13 · 0 ...	12 · 6
9 ...	15 · 5 ...	14 · 5
10 ...	18 · 3 ...	16 · 4
11 ...	21 · 2 ...	18 · 3
12 ...	24 · 1 ...	20 · 7

SIXTY-FIVE GALLONS.

27-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 8 is...	1 · 5
2 ...	2 · 0 ...	3 · 1
3 ...	3 · 8 ...	4 · 8
4 ...	6 · 1 ...	6 · 6
5 ...	8 · 6 ...	8 · 5
6 ...	10 · 6 ...	10 · 3
7 ...	13 · 4 ...	12 · 3
8 ...	16 · 3 ...	14 · 3
9 ...	18 · 7 ...	16 · 5
10 ...	21 · 8 ...	18 · 7
11 ...	24 · 6 ...	21 · 0
12 ...	27 · 6 ...	23 · 5

SIXTY-SIX GALLONS.

27-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 8 is...	1 · 6
2	... 2 · 0	... 3 · 3
3	... 3 · 9	... 5 · 1
4	... 6 · 2	... 6 · 9
5	... 8 · 7	... 8 · 8
6	...10 · 7	...10 · 8
7	...13 · 6	...12 · 9
8	...16 · 0	...15 · 0
9	...19 · 0	...17 · 1
10	...22 · 0	...19 · 4
11	...25 · 0	...21 · 7
12	...28 · 0	...24 · 1

SIXTY-EIGHT GALLONS.

27-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 9 is...	1 · 7
2	... 2 · 0	... 3 · 4
3	... 4 · 0	... 5 · 3
4	... 6 · 3	... 7 · 2
5	... 8 · 6	... 9 · 2
6	...11 · 0	...11 · 2
7	...14 · 0	...13 · 3
8	...17 · 1	...15 · 5
9	...19 · 5	...17 · 7
10	...22 · 8	...20 · 1
11	...26 · 2	...22 · 4
12	...28 · 8	...24 · 9

SEVENTY GALLONS.

27-inch Bung.

In.	G. 10ths.	Altde.
1 is...	0 · 9 is...	1 · 6
2	... 2 · 1	... 3 · 4
3	... 4 · 1	... 5 · 2
4	... 6 · 5	... 7 · 1
5	... 9 · 2	... 9 · 0
6	...11 · 4	...11 · 0
7	...14 · 4	...13 · 1
8	...17 · 6	...15 · 2
9	...20 · 1	...17 · 4
10	...23 · 3	...19 · 7
11	...26 · 6	...22 · 1
12	...29 · 2	...24 · 5

SEVENTY-FOUR GALLONS.

27-inch Bung.

In.	G. 10ths.	Altde.
1 is...	1 · 0 is...	2 · 1
2	... 2 · 6	... 4 · 8
3	... 4 · 5	... 7 · 2
4	... 7 · 0	... 9 · 9
5	... 9 · 9	...12 · 3
6	...12 · 4	...14 · 5
7	...15 · 5	...17 · 0
8	...18 · 6	...19 · 3
9	...21 · 6	...22 · 7
10	...25 · 2	...24 · 6
11	...29 · 0	...26 · 4
12	...32 · 4	...29 · 0

EIGHTY GALLONS.

27-inch Bung.

In.	G. 10ths.	Altde.
1 is...	1 · 0 is...	2 · 0
2	... 3 · 0	... 4 · 0
3	... 5 · 0	... 7 · 0
4	... 7 · 0	... 9 · 0
5	...10 · 0	...11 · 0
6	...13 · 0	...13 · 0
7	...16 · 6	...16 · 0
8	...20 · 1	...18 · 0
9	...23 · 6	...20 · 0
10	...27 · 0	...22 · 0
11	...30 · 8	...24 · 0
12	...34 · 0	...27 · 6

ONE HUNDRED GALLONS.

30-inch Bung.

In.	G. 10ths.	Altde.
1 is...	1 · 8 is...	3 · 2
2	... 3 · 0	... 6 · 5
3	... 5 · 2	... 9 · 7
4	... 7 · 6	...12 · 9
5	...10 · 4	...16 · 2
6	...14 · 4	...19 · 4
7	...17 · 2	...22 · 7
8	...21 · 9	...25 · 9
9	...25 · 4	...29 · 2
10	...28 · 7	...32 · 4
11	...32 · 9	...35 · 7
12	...37 · 3	...38 · 9

ONE HUNDRED AND TEN GALLONS.

32-inch Bung.

In.	G. 10ths.	Altde.
1 is...	1 · 8 is...	2 · 7
2	... 3 · 4	... 5 · 4
3	... 5 · 4	... 8 · 1
4	... 7 · 7	...11 · 6
5	...10 · 6	...14 · 2
6	...14 · 6	...17 · 4
7	...18 · 8	...21 · 0
8	...22 · 7	...24 · 2
9	...26 · 6	...27 · 6
10	...30 · 6	...31 · 0
11	...34 · 0	...34 · 5
12	...38 · 0	...38 · 4

ONE HUNDRED AND FIFTEEN GALLONS.

32-inch Bung.

In.	G. 10ths.	Altde.
1 is..	1 · 8 is...	2 · 8
2	... 3 · 4	... 5 · 9
3	... 5 · 4	... 9 · 0
4	... 8 · 0	...12 · 0
5	...11 · 6	...15 · 6
6	...14 · 9	...19 · 8
7	...18 · 6	...23 · 9
8	...22 · 0	...27 · 9
9	...25 · 6	...30 · 6
10	...29 · 0	...34 · 0
11	...33 · 6	...37 · 9
12	...38 · 6	...40 · 9

ONE HUNDRED AND TWENTY GALLONS.

32-inch Bung.

In.	G. 10ths.	Altde.
1 is...	1 · 6 is...	2 · 6
2	... 3 · 4	... 5 · 4
3	... 5 · 4	... 8 · 2
4	... 7 · 6	...11 · 4
5	...10 · 0	...14 · 4
6	...13 · 6	...18 · 0
7	...16 · 7	...21 · 5
8	...20 · 9	...24 · 0
9	...25 · 0	...27 · 5
10	...29 · 5	...31 · 0
11	...34 · 5	...34 · 5
12	...39 · 9	...38 · 5

The following table calculated for the TEN HOURS' BILL, *shows at one view, the amount per Hour, per Quarter Day, per Half Day, per Three-quarter Day, per Day, per Week, per Month, per three Months, per Half Year, per Year, from Two Shillings to One Pound per Week.*

Week.	Hour.	Quarter Day.	Half Day.	Three Qr. Day.	Day.	Week.	Month.	Three Months	Half Year.	Year.	Total.
s. d.	d.	d.	d.	d.	d.	s. d.	s.	s.	s.	s.	£ s.
2 0	¼	1	2	3	4	2 0	8	24	48	96	4 16
2 3	¼	1	2¼	3¼	4½	2 3	9	27	54	108	5 8
2 6	⅓	1¼	2½	3½	5	2 6	10	30	60	120	6 0
2 9	⅓	1½	2¾	4	5½	2 9	11	33	66	132	6 12
3 0	⅓	1½	3	4½	6	3 0	12	36	72	144	7 4
3 3	⅜	1¾	3¼	4¾	6½	3 3	13	39	78	156	7 16
3 6	⅜	1¾	3½	5¼	7	3 6	14	42	84	168	8 8
3 9	⅜	1¾	3¾	5½	7½	3 9	15	45	90	180	9 0
4 0	½	2	4	6	8	4 0	16	48	96	192	9 12
4 3	1	2	4¼	6¼	8½	4 3	17	51	102	204	10 4
4 6	1	2¼	4½	6¾	9	4 6	18	54	108	216	10 16
4 9	1	2¼	4¾	7	9½	4 9	19	57	114	228	11 8
5 0	1	2½	5	7½	10	5 0	20	60	120	240	12 0
5 3	1	2⅝	5¼	7¾	10½	5 3	21	63	126	252	12 12
5 6	1	2¾	5½	8¼	11	5 6	22	66	132	264	13 4
5 9	1	2⅞	5¾	8½	11½	5 9	23	69	138	276	13 16
6 0	1	3	6	9	12	6 0	24	72	144	288	14 8
6 3	1¼	3	6¼	9¼	12½	6 3	25	75	150	300	15 0
6 6	1¼	3¼	6½	9¾	13	6 6	26	78	156	312	15 12
6 9	1¼	3¼	6¾	10¼	13½	6 9	27	81	162	324	16 4
7 0	1¼	3½	7	10½	14	7 0	28	84	168	336	16 16
7 3	1⅜	3⅝	7¼	10¾	14½	7 3	29	87	174	348	17 8
7 6	1½	3¾	7½	11¼	15	7 6	30	90	180	360	18 0
7 9	1½	3¾	7¾	11½	15½	7 9	31	93	186	372	18 12
8 0	1½	4	8	12	16	8 0	32	96	192	384	19 4
8 3	1¾	4	8¼	12¼	16½	8 3	33	99	198	396	19 16
8 6	1¾	4¼	8½	12¾	17	8 6	34	102	204	408	20 8
8 9	1¾	4¼	8¾	13¼	17½	8 9	35	105	210	420	21 0
9 0	1¾	4½	9	13½	18	9 0	36	108	216	432	21 12
9 3	1¾	4⅝	9¼	14	18½	9 3	37	111	222	444	22 4
9 6	1¾	4¾	9½	14¼	19	9 6	38	114	228	456	22 16
9 9	1¾	4¾	9¾	14¾	19½	9 9	39	117	234	468	23 8
10 0	2	5	10	15	20	10 0	40	120	240	480	24 0
10 6	2	5¼	10½	15¾	21	10 6	42	126	252	504	25 4
11 0	2¼	5½	11	16½	22	11 0	44	132	264	528	26 8
11 6	2¼	5¾	11½	17¼	23	11 6	46	138	276	552	27 12
12 0	2½	6	12	18	24	12 0	48	144	288	576	28 16
12 6	2½	6¼	12½	18¾	25	12 6	50	150	300	600	30 0
13 0	2½	6½	13	19½	26	13 0	52	156	312	624	31 4
13 6	2¾	6¾	13½	20¼	27	13 6	54	162	324	648	32 8
14 0	2¾	7	14	21	28	14 0	56	168	336	672	33 12
14 6	2¾	7¼	14½	21¾	29	14 6	58	174	348	696	34 16
15 0	3	7½	15	22½	30	15 0	60	180	360	720	36 0
15 6	3	7¾	15½	23¼	31	15 6	62	186	372	744	37 4
16 0	3	8	16	24	32	16 0	64	192	384	768	38 8
16 6	3¼	8¼	16½	24¾	33	16 6	66	198	396	792	39 12
17 0	3¼	8½	17	25½	34	17 0	68	204	408	816	40 16
17 6	3½	8¾	17½	26¼	35	17 6	70	210	420	840	42 0
18 0	3½	9	18	27	36	18 0	72	216	432	864	43 4
18 6	3¾	9¼	18½	27¾	37	18 6	74	222	444	888	44 8
19 0	3¾	9½	19	28½	38	19 0	76	228	456	912	45 12
19 6	3¾	9¾	19½	29¼	39	19 6	78	234	468	936	46 16
20 0	4	10	20	30	40	20 0	80	240	480	960	48 0

There are 311 working days in a year, omitting Sundays, Christmas Day, and Good Friday.

APPENDIX.

DECIMAL CALCULATIONS.

As the introduction of a decimal currency into this country has been very properly mooted by the Legislature, and great pains taken to collect information with regard to a change in our monetary system, and the evidence adduced before a Committee of the House of Commons preponderating in favour of a decimal system,—all proving the advantages to be derived from it,—we cannot do better than give, by way of Appendix to the present edition of our book, what we consider sufficient to lay the groundwork of decimal calculations. We, therefore, subjoin such examples in the four fundamental rules of Decimal Arithmetic as will suffice ; together with examples for assimilating the present coins with that of the proposed currency, and again converting them into the present money. The first and most essential point for the student, is to make himself well acquainted with the numeration and multiplication tables : to assist him in the attainment of his object we refer him to our numeration table and new multiplication and division tables, (page 31), constructed on a plan not given by any other author, and which may be committed to memory with the same facility, and, at the same time, as if learning multiplication only.

In all cases we like to begin at the beginning, and so important a subject requires that the public should be first instructed how to reduce shillings, pence, and farthings to florins, cents, and mils, which are the most likely denominations to be given to the new coins,—reducing the same again into pounds, shillings, and pence ; a perfect knowledge of which, will at once show the relative value in both currencies, and should be the first inroad to the public mind.

Our next step will be to calculate quantities at given prices

in both currencies, and to show the brevity of the one with the tedious process in the other. In adverting to the proposed change, we may add, that the decimal system will not only prove advantageous to the merchant, the accountant, and the mechanic, but to the rising generation as well as to teachers and parents. Boys will be taught calculations in the tenth part of the time usually devoted to that purpose: masters will be relieved from the never ending drudgery of their arduous duties, and parents will save immensely by the early and quick education of their children. By this simple process the student will find calculations to amuse rather than embarrass the mind; and the sooner the system is adopted, the more speedily will he experience its beneficial effects.

It would be well if the merchants and traders of this great commercial country would, together with the professors and teachers, petition Parliament for a speedy completion of the work so wisely contemplated by the Government, and so strongly recommended in the evidences of gentlemen whose opinions we here record from the analysis on the subject before a Committee of the House of Commons. We refer:—

Firstly—To that of PROFESSOR AIRY, *Astronomer Royal*, who says: "The present monetary system of this country is in the main very inconvenient, and gives rise, from its irregularity, to much labour and to great liability to error; and that the decimal system would be made in about half the time they now occupy."

Secondly—THOMAS BAZLEY, Esq., President of the Manchester Chamber of Commerce, says: "The simplicity of a decimal coinage would save considerable time and labour in calculations, and might be adopted without inconvenience to the working classes."

Thirdly—DR. JOHN BOWRING, Consul at Canton, and Plenipotentiary at Hong Kong, states: "That in China, children of seven years of age keep accounts with simplicity and facility, and that the system should be introduced quickly; that its adoption is demanded by the benefits that would arise in the keeping of accounts and foreign exchanges."

Fourthly—AUGUSTUS DE MORGAN, Professor of Mathematics *in the* University, adds: "That the advantages of a change from

our present system of coinage to a decimal system, would be very considerable, and great saving would be effected in calculations generally, and in the teaching of Arithmetic; if a decimal coinage were adopted."

Fifthly—SIR J. HERSCHEL, Master of the Royal Mint, says: "The adoption of the decimal system would reduce, immensely, the labour of scholars and teachers in schools, and would be of the greatest benefit in calculations generally."

Sixthly—THOMAS HANKEY, Esq., late Governor of the Bank of England, says: "The advantages of a change from our present system of coinage to a decimal system, would be very considerable; great saving of time and labour would be effected in calculations generally."

From what has been stated in the foregoing evidence, little doubt may be entertained as to the advantage that will accrue from a decimal system. As to the denominations of the coins, it is most probable that the florin, cent, and mil, will replace our shilling, penny, and farthing—a pound sterling standing as the integer; but no matter what denominations may be selected, all must agree, that every calculation will be based on the tenth, hundredth, and thousandth.

THE AUTHOR.

13, SMITHY DOOR,
MANCHESTER, 1857.

REDUCTION OF DECIMAL FRACTIONS.*

PROBLEM 1.

To reduce fractions to decimals.

RULE.—Affix ciphers to the numerator, and divide by the denominator, the quotient will be the decimal. You must have as many decimal places in the answer as you annex ciphers.

EXAMPLES.

1.—Reduce $\frac{5}{8}$ to a decimal?

$\div 8) 5{\cdot}000$

$\cdot 652$ Ans.

2.—Reduce $1\frac{3}{16}$ to a decimal?

$\div 16)\ 13{\cdot}0000$

$\cdot 8125$ Ans.

3.—Bring 1s. $6\frac{1}{2}$d. to the decimal of a pound?

1s. $6\frac{1}{2}$d. $= \frac{37}{480}$

$480) 37{\cdot}00000$

$\cdot 77083$ Ans.

4.—Reduce $\frac{7}{8}$ to a decimal?

$\div 8) 7{\cdot}000$

$\cdot 875$ Ans.

5.—Bring 3d. to the decimal of 1s.?

$1\frac{3}{12} \div 12) 3{\cdot}00$

$\cdot 25$ Ans.

6.—Bring 13s. $4\frac{3}{4}$d. to the decimal of a pound?

$\frac{643}{960}$

$960) 643{\cdot}000000$

$\cdot 669797$ Ans.

ADDITION.

RULE.—Set down units under units, tens under tens, and in integers, separating with a decimal point, so that tens may fall under tens, hundreds under hundreds, &c. Add them up as whole numbers, keeping the decimal points under each other: the sum must have as many decimals as the numbers to be added.

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* *Decimals Mean Tenths, &c.*—In calculating from left to right, the value of each figure is ten times less than the preceeding one: ·2 is $\frac{2}{10}$, ·02 is $\frac{2}{100}$, ·0003 is $\frac{3}{10000}$; ·47 reads, four tenths seven hundred parts; ·375 reads, three tenths, seven hundred, five thousand parts, &c.

Decimals increase their value from right to left, and decrease from left to right; they may be annexed to whole numbers, and added, subtracted, or divided the same way. If you annex ciphers to the right of decimals, it will not alter their value; ·2 or $\frac{2}{10}$, ·30 or $\frac{3}{100}$, ·400 or $\frac{4}{1000}$.

EXAMPLES.

1.—What is the sum of 127·35; 34·56; 83·176; 341·284; 13·341.

127·35
34·56
83·176
341·284
13·341
599·711 Ans.

2.—What is the sum of 37·568; 9·367; 428·0076; 34·51; 110·33; 91·576?

37·568
9·367
428·0076
34·51
110·33
91·576
711·3586 Ans.

SUBTRACTION.

RULE.—Write your numbers with the decimal points as in addition; subtract as in whole numbers; point off as many figures for decimals in the remainder as there are in either of the numbers to be subtracted.

EXAMPLES.

1.—Subtract 67·34 from 104·532?

From 104·532
Take 67·34
Ans. 37·192

2.—From 13·348 take 9·2993?

13·348
9·2993
Ans. 4·0487

NOTE.—In repeating decimals, set them down as before, but borrow from 9 instead of 10.

MULTIPLICATION.

RULE.—Multiply as in whole numbers; point off as many figures for decimals as there are in multiplicand and multiplier.

EXAMPLES.

1.—Multiply 2·734 by 4·35

·13670
·8202
10·936
11·89290 Ans.

2.—Multiply ·125 by ·12

*·01500 Ans.

*When you have not as many figures in the product as you should have decimals, add ·0 as above.

DIVISION.

RULE.—Divide as in whole numbers; point off as many decimals in the quotient as the number in the dividend exceeds the number in the divisor; have the decimal figures in the divisor and quotient equal to that in the dividend.

EXAMPLES.

1.—Divide 173·54250 by 3·75?
+3·75)————
Quot. 46·278

2.—Divide 987·56384 by 5·87?
+5·87 ————
Quot. 166·535

Observe.—You have five decimal places in the dividend, and two in the divisor, consequently, the difference is three decimal places, which is the number to be pointed off.

REDUCTION OF DECIMAL COINS ACCORDING TO THE PLAN LAID BEFORE THE COMMITTEE OF THE HOUSE OF COMMONS.

TABLE.—10 mils, 1 cent; 10 cents, 1 florin; 10 florins, 1 pound sterling; 1000 mils = 100 cents; 100 cents = 10 florins; 10 florins = £1.

PROBLEM 1.

To bring farthings, pence, and shillings, to mils, cents, and florins; a pound being the integer.

RULE.—For the farthings divide 960 (the farthings in a pound) into 1000 (the mils in a pound); for halfpence, 480; for pence, 240; multiplying the quotient in each case, by the number of farthings, halfpence, pence, &c., and you have the mils, cents, and florins.

EXAMPLES.

1.—In ¼d., how many mils? ÷960) 1000 = 1m. 1-24th. Ans.
2.—In ½d., how many mils? ÷480) 1000 = 2m. 1-12th. Ans.
3.—In ¾d., how many mils? ÷960) 1000 = 1m. 1-24th × 3 = 3m. 1-8th. Ans.
4.—In 1d., how many mils? ÷240) 1000 = 4m. 1-6th. Ans.
5.—Bring 2d. to mils? ÷240) 1000 = 4m. 1-6th × 2 = 8m. 1-3rd. Ans.
6.—Bring 5d. to cents and mils? ÷240) 1000 = 4m. 1-6th × 5 = 2c. 0m. 5-6ths. Ans.
7.—In 8d., how many cents and mils? ÷240) 1000 = 4m. 1-6th × 8 = 3c. 3m. 1-3rd. Ans.
8.—How many cents and mils in 12d.? ÷240) 1000 = 4m. 1-6th × 12 = 5c. 0m. Ans.
9.—In 3s. 10d., how many florins, cents, and mils? ÷240) 1000 = 4m. 1-6th × 46 = 1f. 9c. 1m. 2-3rds. Ans.
10.—In 5s., how many florins, cents, and mils? ÷240) 1000 = 4m. 1-6th × 60 = 2f. 5c. Ans.
11.—In 10s. how many florins, cents, and mils? ÷240) 1000 = 4m. 1-6th × 120 = 5f. Ans.
12.—In 15s., how many florins, cents, and mils? ÷240) 1000 = 4m. 1-6th × 180 = 7f. 5c. Ans.

NOTE.—The residual number after the mils perfects the equivalent, and represents fractional parts, 24 of which make $\frac{1}{1000}$ of £1 or mil, (·001), *as will be* seen in the above table. A sovereign = 1000m.; half ditto,

500m.; a crown, 250m.; half ditto, 125m.; a florin, 100m.; a shilling, ·05c.; sixpence, ·02c. 5m.; fourpence, ·01c. 6m. 2-3rd; one penny, ·004m. 1-6th; half-penny = ·002m. 1-12th; and one farthing = ·001m. 1-24th.

Enough has been said to show how farthings, pence, and shillings, may be reduced to mils, cents, and florins; and this is the first step in decimal currency recommended to those who wish to become acquainted with a change in the currency.

REVERSE OF THE FOREGOING.

PROBLEM 2.

To reduce mils, cents, and florins to pence, shillings, and pounds.

RULE.—Multiply 240, the pence in a pound, by the number of mils, cents, and florins; divide the product by 1000, and you have the answer in pence and shillings.

EXAMPLES.

1.—In 4 mils 1-16th, how many pence? 240 × 4m. 1-6th = 1000 ÷ 1000 = 1d. Ans.

2.—In 6 mils 1-4th, how many pence? 240 × 6m. 1-4th = 1500 ÷ 1000 = 1½d. Ans.

3.—In 8 mils 1-3rd, how many pence? 240 × 8m. 1-3rd = 2000 ÷ 1000 = 2d. Ans.

4.—In 4 cents 5 mils 5-6th, how many pence? 240 × 4c. 5m. 5-6th = 11,000 ÷ 1000 = 11d. Ans.

5.—How many pence in 5 cents? 240 × 5c. = 12,000 ÷ 1000 = 12d. Ans.

6.—In 1 florin 2 cents 9 mils 1-6th, how many shillings? 240 × 1f. 2c. 9m. 1-6th = 31,000 ÷ 1000 = 31d., or 2s. 7d. Ans.

7.—In 2 florins, how many shillings? 240 × 2f. = 48,000 ÷ 1000 = 48d., or 4s. Ans.

8.—In 3 florins 9 cents 1 mil 2-3rds, how many pence? 240 × 3f. 9c. 1m. 2-3rds = 94,000 ÷ 1000 = 94d., or 7s. 10d. Ans.

9.—In 5 florins, how many shillings? 240 × 5f. = 120,000 ÷ 1000 = 120d., or 10s. Ans.

10.—In 9 florins 7 cents 5 mils, how many shillings? 240 × 9f. 7c. 5m. = 234,000 ÷ 1000 = 234d., or 19s. 6d. Ans.

11.—In 1000 cents, how many shillings? 240 × 1000c. = 240,000 ÷ 1000 = 240d. ÷ 12d. = 20s., or £1. Ans.

MERCANTILE CALCULATIONS BY DECIMALS; THE SAME CHANGED INTO THE PRESENT CURRENCY.

PROBLEM 3.

To calculate any number of yards, tons, cwts., qrs., lbs., &c., at any number of mils, cents, and florins, per yard, per ton, per cwt., per qr., per lb., &c.

RULE.—Multiply mils, cents, and florins by the quantity, and the answer

will be in florins, cents, and mils. If you require the same in the present currency, multiply 240 by the number of florins, cents, and mils; divide the product by 1000, and you have the answer in pounds, shillings, and pence.

EXAMPLES.

1.—What will 10 yards of calico come to, at 8½m. per yard?

$$\begin{array}{r} 8\frac{1}{2} \\ 10 \\ \hline 83\frac{1}{2}\text{m. Ans. in decimals.} \end{array}$$

$240 \times 83\frac{1}{2} = 20.000 \div 1000 = 20\text{d.}$, or 1s. 8d. Ans. in s. d.

2.—What will 25 yards of linen come to, at 9c. 3m. per yard? 9c. 3m. × 25 = 23f. 2c. 5m. Ans. in decimals.

$$2325 \times 240 = 558000$$
$$\div 1000)$$
$$558\text{d.} = £2\ 6\text{s.}\ 6\text{d. Ans. in P. C.*}$$

3.—What will 37 lbs. of tea come to, at 2 florins 3 cents 7 mils per lb.? 2f. 3c. 7m. × 37 = 87f. 6c. 9m. Ans. in decimals.

$$8769 \times 240 = 2104560$$
$$\div 1000)$$
$$2104\tfrac{1}{2}\text{d.} = £8\ 15\text{s.}\ 4\tfrac{1}{2}\text{d. Ans. in P. C.}$$

4.—What is the amount of 50 yards of silk, at 2 florins 3 cents 9 mils per yard, in decimals; also in the present coins? 2f. 3c. 9m. × 50 = 11950f. 5c. Ans. in decimals.

$$11950 \times 240 = 2868000$$
$$\div 1000)$$
$$2868\text{d.} = £11\ 19\text{s. Ans. in P. C.}$$

5.—What is the amount of 99 gallons of brandy, at 9 florins 3 cents 7 mils per gallon; the same in present currency? 9f. 3c. 7m. = 99 = 932f. 6c. 3m. Ans. in decimals.

$$93263 \times 240 = 22383120$$
$$\div 1000)$$
$$22383\tfrac{3}{125}\text{d.} = £93\ 5\text{s.}\ 3\tfrac{3}{125}\text{d. Ans. in P. C.}$$

6.—What will the carriage of 80 tons of goods from London to Manchester come to at 9 florins 3 cents 6 mils per ton; the same in present currency? 9f. 3c. 6m. × 80 = 748f. 8c. 0m. Ans. in decimals.

$$74880 \times 240 = 17971200$$
$$\div 1000)$$
$$17971\tfrac{1}{2}\text{d.} = £74\ 17\text{s.}\ 7\tfrac{1}{2}\text{d. Ans. in P. C.}$$

* N.B.—P. C. means present currency.

7.—What will 374 lbs. of spun silk come to, at 7 florins 5 cents 3 mils per lb.? The amount in decimals and present money is required? 7f. 5c. 3m. × 374 = 2816f. 2c. 2m. Ans. in decimals.

281622 × 240 = 67589280
÷1000)

67589$\frac{4}{5}$d. = £281 12s. 5$\frac{4}{5}$d. Ans. in P. C.

8.—What is the amount of 745 feet of mahogany, at 1 florin 3 cents 5 mils per foot; the same reduced to present currency? 1f. 3c. 5m. × 745 = 1017f. 9c. Ans. in decimals.

101790 × 240 = 24429600
÷1000)

24429$\frac{3}{5}$d. = £101 15s. 9$\frac{3}{5}$d. Ans. in P. C.

9.—What will 212 yards of French cambric come to, at 7 florins 5 cents 8 mils per yard, in decimal and present currency? 7f. 5c. 8m. × 212 = 1606f. 9c. 6m. Ans. in decimals.

160696 × 240 = 38567040
÷1000)

38567$\frac{1}{5}$d. = £160 13s. 11$\frac{1}{5}$d. Ans. in P. C.

10.—What will 2319 lbs. of cast steel come to, at 2 cents 9 mils per lb.; the same in present money? 2319 × 29 = 672f. 5c. 1m. Ans. in decimals.

67251 × 240 = 16140240
÷1000)

16140$\frac{6}{5}$d. = £67 5s. 0$\frac{6}{5}$d. Ans. in P. C.

11.—What will 721 cwt. of iron come to, at 8 florins 9 cents 9 mils per cwt.; the same in decimal money? 8f. 9c. 9m. × 721 = 6481f. 7c. 9m. Ans. in decimals.

648179 × 240 = 155562960
÷1000)

155562$\frac{2}{2}\frac{4}{5}$d. = £648 3s. 6$\frac{2}{2}\frac{4}{5}$d. Ans. in P. C.

12.—What will 1476 tons of coal come to, at 5 florins 3 cents 7 mils per ton; the amount required in both currencies. 1476 × 537 = 7926f. 1c. 2m. Ans. in decimals.

792612 × 240 = 190226880
÷1000)

190226$\frac{3}{4}$d. = £792 12s. 2$\frac{3}{4}$d. Ans. in P. C.

SHOWING THE DECIMAL EQUIVALENT IN 1,000TH OF £1, (MIL), FROM ¼D. TO £1; ALSO THE CONVERSE AT SIGHT.

Present Curcy.	Decimal of £1 or Mil.	24 Parts = 1 Mil.	Present Currency.	Decimal of £1 or Mil.	Present Currency.	Decimal of £1 or Mil.
D.	F. C. M.		S. D.	F. C. M.	S. D.	F. C. M.
¼	·0 0 1	1–24	1 1	·0 5 4	5 1	·2 5 4
½	·0 0 2	1–12	1 2	·0 5 8	5 2	·2 5 8
¾	·0 0 3	1–8	1 3	·0 6 2	5 3	·2 6 2
1	·0 0 4	1–6	1 4	·0 6 6½	5 4	·2 6 7
1¼	·0 0 5	5–24	1 5	·0 7 0	5 5	·2 7 1
1½	·0 0 6	1–4	1 6	·0 7 5	5 6	·2 7 5
1¾	·0 0 7	7–24	1 7	·0 7 9	5 7	·2 7 9
2	·0 0 8	1–3	1 8	·0 8 3	5 8	·2 8 3
2¼	·0 0 9	3–8	1 9	·0 8 7	5 9	·2 8 7
2½	·0 1 0	5–12	1 10	·0 9 1	5 10	·2 9 2
2¾	·0 1 1	11–24	1 11	·0 9 5	5 11	·2 9 6
3	·0 1 2	1–2	2 0	·1 0 0	6 0	·3 0 0
3¼	·0 1 3	13–24	2 1	·1 0 4	6 1	·3 0 4
3½	·0 1 4	7–12	2 2	·1 0 8	6 2	·3 0 8
3¾	·0 1 5	5–8	2 3	·1 1 2	6 3	·3 1 2
4	·0 1 6	2–3	2 4	·1 1 6	6 4	·3 1 7
4¼	·0 1 7	17–24	2 5	·1 2 0	6 5	·3 2 1
4½	·0 1 8	3–4	2 6	·1 2 5	6 6	·3 2 5
4¾	·0 1 9	19–24	2 7	·1 2 9	6 7	·3 2 9
5	·0 2 0	5–6	2 8	·1 3 3	6 8	·3 3 3
5¼	·0 2 1	7–8	2 9	·1 3 7	6 9	·3 3 7
5½	·0 2 2	11–12	2 10	·1 4 1	6 10	·3 4 2
5¾	·0 2 3	23–24	2 11	·1 4 5	6 11	·3 4 6
6	·0 2 5	.....	3 0	·1 5 0	7 0	·3 5 0
6¼	·0 2 6	1–24	3 1	·1 5 4	7 1	·3 5 4
6½	·0 2 7	1–12	3 2	·1 5 8	7 2	·3 5 8
6¾	·0 2 8	1–8	3 3	·1 6 2	7 3	·3 6 2
7	·0 2 9	1–6	3 4	·1 6 6	7 4	·3 6 7
7¼	·0 3 0	5–24	3 5	·1 7 0	7 5	·3 7 1
7½	·0 3 1	1–4	3 6	·1 7 5	7 6	·3 7 5
7¾	·0 3 2	7–24	3 7	·1 7 9	7 7	·3 7 9
8	·0 3 3	1–3	3 8	·1 8 3	7 8	·3 8 3
8¼	·0 3 4	3–8	3 9	·1 8 7	7 9	·3 8 7
8½	·0 3 5	5–12	3 10	·1 9 1	7 10	·3 9 2
8¾	·0 3 6	11–24	3 11	·1 9 5	7 11	·3 9 6
9	·0 3 7	1–2	4 0	·2 0 0	8 0	·4 0 0
9¼	·0 3 8	13–24	4 1	·2 0 4	8 1	·4 0 4
9½	·0 3 9	7–12	4 2	·2 0 8	8 2	·4 0 8
9¾	·0 4 0	5–8	4 3	·2 1 2	8 3	·4 1 2
10	·0 4 1	2–3	4 4	·2 1 6	8 4	·4 1 7
10¼	·0 4 2	17–24	4 5	·2 2 0	8 5	·4 2 1
10½	·0 4 3	3–4	4 6	·2 2 5	8 6	·4 2 5
10¾	·0 4 4	19–24	4 7	·2 2 9	8 7	·4 2 9
11	·0 4 5	5–6	4 8	·2 3 3	8 8	·4 3 3
11¼	·0 4 6	7–8	4 9	·2 3 7	8 9	·4 3 7
11½	·0 4 7	11–12	4 10	·2 4 1	8 10	·4 4 2
11¾	·0 4 8	23–24	4 11	·2 4 5	8 11	·4 4 6
12	·0 5 0	.....	5 0	·2 5 0	9 0	·4 5 0

SHOWING THE DECIMAL EQUIVALENT IN 1,000TH OF £1, (MIL,) FROM ¼D. TO £1; ALSO THE CONVERSE AT SIGHT.

Present Currency.	Decimal of £1 or Mil.	Present Currency.	Decimal of £1 or Mil.	Present Currency.	Decimal of £1 or Mil.	24 Parts =1 Mil.
S. D.	F. C. M.	S. D.	F. C. M.	S. D.	£ F. C. M.	
9 1	·4 5 4	13 1	·6 5 4	17 1	·8 5 4	4
9 2	·4 5 8	13 2	·6 5 8	17 2	·8 5 8	8
9 3	·4 6 2	13 3	·6 6 2	17 3	·8 6 2	12
9 4	·4 6 7	13 4	.6 6 7	17 4	·8 6 8	16
9 5	·4 7 1	13 5	·6 7 1	17 5	·8 7 0	20
9 6	·4 7 5	13 6	·6 7 5	17 6	·8 7 5	0
9 7	·4 7 9	13 7	·6 7 9	17 7	·8 7 9	4
9 8	·4 8 3	13 8	·6 8 3	17 8	·8 8 3	8
9 9	·4 8 7	13 9	·6 8 7	17 9	·8 8 7	12
9 10	·4 9 2	13 10	·6 9 2	17 10	·8 9 1	16
9 11	·4 9 6	13 11	·6 9 6	17 11	·8 9 5	20
10 0	·5 0 0	14 0	·7 0 0	18 0	·9 0 0	0
10 1	·5 0 4	14 1	·7 0 4	18 1	·9 0 4	4
10 2	·5 0 8	14 2	·7 0 8	18 2	·9 0 8	8
10 3	·5 1 2	14 3	·7 1 2	18 3	·9 1 2	12
10 4	·5 1 7	14 4	·7 1 7	18 4	·9 1 6	16
10 5	·5 2 1	14 5	·7 2 1	18 5	·9 2 0	20
10 6	·5 2 5	14 6	·7 2 5	18 6	·9 2 5	0
10 7	·5 2 9	14 7	·7 2 9	18 7	·9 2 9	4
10 8	·5 3 3	14 8	·7 3 3	18 8	·9 3 3	8
10 9	·5 3 7	14 9	·7 3 7	18 9	·9 3 7	12
10 10	·5 4 2	14 10	·7 4 2	18 10	·9 4 1	16
10 11	·5 4 6	14 11	·7 4 6	18 11	·9 4 5	20
11 0	·5 5 0	15 0	·7 5 0	18 11½	·9 4 7	22
11 1	·5 5 4	15 1	·7 5 4	19 0	·9 5 0	0
11 2	·5 5 8	15 2	·7 5 8	19 0½	·9 5 2	2
11 3	·5 6 2	15 3	·7 6 2	19 1	·9 5 4	4
11 4	·5 6 7	15 4	·7 6 7	19 1½	·9 5 6	6
11 5	·5 7 1	15 5	·7 7 1	19 2	·9 5 8	8
11 6	·5 7 5	15 6	·7 7 5	19 2½	·9 6 0	10
11 7	·5 7 9	15 7	·7 7 9	19 3	·9 6 2	12
11 8	·5 8 3	15 8	·7 8 3	19 3½	·9 6 4	14
11 9	·5 8 7	15 9	·7 8 7	19 4	·9 6 6	16
11 10	·5 9 2	15 10	·7 9 2	19 4½	·9 6 8	18
11 11	·5 9 6	15 11	·7 9 6	19 5	·9 7 0	20
12 0	·6 0 0	16 0	·8 0 0	19 5½	·9 7 2	22
12 1	·6 0 4	16 1	·8 0 4	19 6	·9 7 5	0
12 2	·6 0 8	16 2	·8 0 8	19 6½	·9 7 7	2
12 3	·6 1 2	16 3	·8 1 2	19 7	·9 7 9	4
12 4	·6 1 7	16 4	·8 1 6	19 7½	·9 8 1	6
12 5	·6 2 1	16 5	·8 2 0	19 8	·9 8 3	8
12 6	·6 2 5	16 6	·8 2 5	19 8½	·9 8 5	10
12 7	·6 2 9	16 7	·8 2 9	19 9	·9 8 7	12
12 8	·6 3 3	16 8	·8 3 3	19 9½	·9 8 9	14
12 9	·6 3 7	16 9	·8 3 7	19 10	·9 9 1	16
12 10	·6 4 2	16 10	·8 4 1	19 10½	·9 9 3	18
12 11	·6 4 6	16 11	·8 4 5	19 11	·9 9 5	20
13 0	·6 5 0	17 0	·8 5 0	20 0	1·0 0 0	0

USE OF DECIMALS BY LOGARITHMS.

The following Tables have been written with a view to enable the Arithmetician to avail himself of the valuable aid of Logarithms. Their use will assist to remove all obstacles in the absence of decimal coins, &c.

To form an idea of the nature of Logarithms, we must call to mind that in every multiplication of a whole number, the proportion of the product to the multiplicand is the same as the proportion of the multiplier to unity; it then follows that the proportion of the product to unity must be equal to the sum of the two proportions of the multiplier to unity, and of the multiplicand to unity, since it is compounded of the proportions of itself to the multiplicand, and of the multiplicand to unity. Any artificial numbers therefore, which represent the proportions of all sorts of numbers to unity, will be the addition of those two that represent the proportions of any multiplier and multiplicand to unity, and give an artificial number representing the proportion of the product to unity, consequently, the natural number to which it would correspond in the table would be the product of the multiplicand and multiplier.

A series of numbers in Arithmetical progression, corresponding to as many others in Geometrical progression; so that 0 in Arithmeticals corresponds to 1 in the Geometricals, and supplies the artificial numbers we require:—

0* 1 2 3 4 5 6 Arithmetical progression, or Logarithms.
1 2 4 8 16 32 64 Geometrical progression, or natural numbers.
1 10 100 1000 10,000 100,000 1,000,000

EXAMPLES.

1.—To multiply 8 by 4?

Log. of 8 = 3
Log. of 4 = 2

Log. of 32 = 5 Sum.

2.—To multiply 1000 by 100?

Log. of 1000 = 3
Log. of 100 = 2

Log. of 100,000 = 5 Sum.

Division is performed by the subtraction of the Logarithm of the divisor from the Logarithm of the dividend, the remainder is the Logarithm of the quotient.

EXAMPLE.

3.—Divide 64 by 8?

Log. of 64 = 6
Log. of 8 = 3

Log. of 8 = 3 Sum.

* By ranging the second term 2 or 10 of the Geometrical progression, it is apparent that we may have an endless variety of Logarithms to the same natural numbers; for it is evident, that whatever number represents the ratio or proportion of 10 to 1, the ratio of 100 to 1, and of 1000 to 1, can only be represented by twice or three times that number, since their *proportions* to 1 are double and triple the ratio of 10 to 1.

NEW DECIMAL TABLES,

Showing the Value of Decimals in Money, Weights, and Measures.

TABLE I.—OF MONEY.

A Shilling the Integer.		
D.	Q.	Decimal Parts.
0	¼	s. 0·020833
0	½	·041666
0	¾	·0625
1	0	·083333
1	¼	·104166
1	½	·125
1	¾	·145833
2	0	·166666
2	¼	·1875
2	½	·208333
2	¾	·227166
3	0	·25
3	¼	·270833
3	½	·291666
3	¾	·3125
4	0	·333333
4	¼	·354166
4	½	·375
4	¾	·395833
5	0	·416666
5	¼	·4375
5	½	·458333
5	¾	·479166
6	0	·5
6	¼	·520833
6	½	·541666
6	¾	·5625
7	0	·583333
7	¼	·604166
7	½	·625
7	¾	·645833
8	0	·666666
8	¼	·6875
8	½	·708333
8	¾	·729166
9	0	·75
9	¼	·770833
9	½	·791666
9	¾	·8125
10	0	·833333
10	¼	·854166
10	½	·875
10	¾	·895833
11	0	·916666
11	¼	·9375
11	½	·958333
11	¾	·979166
12	0	1·000000

A Pound the Integer.		
D.	Q.	Decimal Parts.
0	¼	s.0·0010416
0	½	·002083
0	¾	·003125
1	0	·004166
1	¼	·0052
1	½	·00625
1	¾	·00729
2	0	·00833
2	¼	·009375
2	½	·010416
2	¾	·0114583
3	0	·0125
3	¼	·0135416
3	½	·014583
3	¾	·015625
4	0	·016666
4	¼	·0177083
4	½	·01875
4	¾	·0197916
5	0	·02083
5	¼	·021875
5	½	·022916
5	¾	·0239583
6	0	·025
6	¼	·0260416
6	½	·0270083
6	¾	·028125
7	0	·029166
7	¼	·0302083
7	½	·03125
7	¾	·0322916
8	0	·033333
8	¼	·034375
8	½	·035416
8	¾	·0364583
9	0	·0375
9	¼	·0385416
9	½	·039583
9	¾	·040625
10	0	·041666
10	¼	·0427083
10	½	·04375
10	¾	·0447916
11	0	·045833
11	¼	·046875
11	½	·047916
11	¾	·0489583
12	0	1·0000000

A Pound the Integer.	
s.	Decimal Parts.
1	£0·05
2	·1
3	·15
4	·2
5	·25
6	·3
7	·35
8	·4
9	·45
10	·5
11	·55
12	·6
13	·65
14	·7
15	·75
16	·8
17	·85
18	·9
19	·95
20	£1·00

NOTE.—By these and the following Tables, all the species of Money, Weight, and Measure, are turned into decimal parts, and results obtained with the greatest facility, whatever may be the integer.

As to the use and application of the Tables, they are so very clear and intelligible, as to require little explanation. Their familiarity to the student will soon make him acquainted with the many advantages to be derived from the system of Decimal Calculations.

TABLE II.—TROY WEIGHT.

A lb. the Integer.	Decimal Parts of 1 lb. Troy.
1 grain	lb. 0·0001736
2 „	·0003472
3 „	·0005208
4 g., or 1 carat .	·0006944
2 carats	·0013889
3 „	·0020833
4 „	·0027778
5 „	·0034722
6 c., or 1 dwt....	·0041667
2 dwts.	·0083333
3 „	·0125000
4 „	·0166667
5 „	·0208333
6 „	·0250000
7 „	·0291667
8 „	·0333333
9 „	·0375000
10 „	·0416667
11 „	·0458333
12 „	·0500000
13 „	·0541667
14 „	·0583333
15 „	·0625000
16 „	·0666667
17 „	·0708333
18 „	·0750000
19 „	·0791667
20 dwts. or 1 oz. .	·0833333
2 oz.	·1666667
3 „	·2500000
4 „	·3333333
5 „	·4166667
6 „	·5000000
7 „	·5833333
8 „	·6666667
9 „	·7500000
10 „	·8333333
11 „	·9166667
12 „	1·0000000

TABLE III.—AVOIRDUPOIS.

A lb. the Integer.	Decimal Parts.
1 drachm ...	lb. 0·0039063
2 „	·0078125
3 „	·0117188
4 „	·0156250
5 „	·0195313
6 „	·0234375
7 „	·0273438
8 „	·0312500
9 „	·0351563
10 „	·0390625
11 „	·0429688
12 „	·0468750
13 „	·0507813
14 „	·0546875
15 „	·0585938
16 d., or 1 oz. ...	·0625000
2 oz.	·1250000
3 „	·1875000
4 „	·2500000
5 „	·3125000
6 „	·3750000
7 „	·4375000
8 „	·5000000
9 „	·5625000
10 „	·6250000
11 „	·6875000
12 „	·7500000
13 „	·8125000
14 „	·8750000
15 „	·9375000
16 oz., or 1 lb....	1·0000000

NOTE.—Table III. in Avoirdupois Weight is used in small quantities, and Table IV. is constructed for large ones.

TABLE IV.—AVOIRDUPOIS.

A cwt. the Integer.	Decimal Parts of 1 cwt.
	cwt.
1 drachm ...	0·0000349
2 „	·0000698
3 „	·0001046
4 „	·0001395
5 „	·0001744
6 „	·0002093
7 „	·0002441
8 „	·0002790
9 „	·0003139
10 „	·0003488
11 „	·0003837
12 „	·0004185
13 „	·0004534
14 „	·0004883
15 „	·0005232
16 d., or 1 oz. ...	·0005580
2 oz.	·0011161
3 „	·0016741
4 „	·0022321
5 „	·0027902
6 „	·0033482
7 „	·0039063
8 „	·0044643
9 „	·0050223
10 „	·0055804
11 „	·0061384
12 „	·0066964
13 „	·0072545
14 „	·0078125
15 „	·0083705
16 oz., or 1 lb. ...	·0089286
2 lbs.	·0178571
3 „	·0267857
4 „	·0357143
5 „	·0446429
6 „	·0535714
7 „	·0625000
8 „	·0714286
9 „	·0803571
10 „	·0892857
11 „	·0982143
12 „	·1071429
13 „	·1160714
14 lbs., or 1 st. ...	·1250000
1 qr.	·2500000
2 qrs.	·5000000
3 „	·7500000
4 „ or 1 cwt...	1·0000000

TABLE V.—CHEMISTS' WEIGHT.

A lb. the Integer.	Decimal Parts.
1 grain	lb. 0·0001736
2 „	·0003472
3 „	·0005208
4 „	·0006944
5 „	·0008681
6 „	·0010417
7 „	·0012153
8 „	·0013809
9 „	·0015625
10 „	·0017361
11 „	·0019097
12 „	·0020833
13 „	·0022569
14 „	·0024306
15 „	·0026042
16 „	·0027778
17 „	·0029514
18 „	·0031250
19 „	·0032986
20 gr., or 1 scr....	·0034722
2 scruples ...	·0069444
3 ditto, or 1 dr..	·0104167
2 drachms ...	·0208333
3 „	·0312500
4 „	·0416667
5 „	·0520833
6 „	·0625000
7 „	·0729167
8 drs., or 1 oz....	·0833333
2 oz.	·1666667
3 „	·2500000
4 „	·3333333
5 „	·4166667
6 „	·5000000
7 „	·5833333
8 „	·6666667
9 „	·7500000
10 „	·8333333
11 „	·9166667
12 „ or 1 lb...	1·0000000

TABLE VI.—LONG MEASURE.

A Mile the Integer.	Decimal Parts.
1 barleycorn ...	M. 0·0000053
2 ditto	·0000105
3 b.c., or inch...	·0000158
2 inches	·0000316
3 ditto	·0000473
4 in., or 1 hand.	·0000631
5 inches	·0000789
6 ditto	·0000947
7 ditto	·0001105
8 ditto	·0001263
9 ditto	·0001421
10 ditto	·0001578
11 ditto	·0001736
12 in., or 1 foot..	·0001894
2 feet	·0003788
3 ft., or 1 yard..	·0005682
2 yards	·0011364
3 ditto	·0017046
4 ditto	·0022727
5½ ditto ... } 1 pole ... }	·0028409 ·0031250
2 poles	·0062500
3 ditto	·0093750
4 poles, or 1 landchain }	·0125000
2 chains	·0250000
3 ditto	·0375000
4 ditto	·0500000
5 ditto	·0625000
6 ditto	·0750000
7 ditto	·0875000
8 ditto	·1000000
9 ditto	·1125000
10 do., or 1 furlg.	·1250000
2 furlongs ...	·2500000
3 ditto	·3750000
4 ditto	·5000000
5 ditto	·6200000
6 ditto	·7500000
7 ditto	·8750000
8 do., or 1 mile.	1·0000000

TABLE VII.—CLOTH MEASURE.

A Yard the Integer.	Decimal Parts.
¼ inch	yd.0·0069444
½ ditto	·0138889
¾ ditto	·0208333
1 ditto	·0277778
2 ditto	·0555555
1 nail	·0625000
2 ditto	·1250000
3 ditto	·1875000
4 do., or 1 qr....	·2500000
2 quarters ...	·5000000
3 ditto	·7500000
4 do., or1 yard .	1·0000000

TABLE VIII.
Ale, Beer, Spirit, and Wine Measure.

A Gallon the Integer.	Decimal Parts.
1 gill	gal. 0·0312500
2 ditto	·0625000
3 ditto	·0937500
4 g., or 1 pint...	·1250000
2 p., or 1 qrt....	·2500000
2 quarts	·5000000
3 ditto	·7500000
4 do., or 1 gal...	1·0000000

TABLE IX.—DRY MEASURE.

A Quarter the Integer.	Decimal Parts.
1 pint	qrs.0·0019531
2 p., or 1 quart.	·0039063
2 q., or 1 pottle.	·0078125
2 p., or 1 gal. ...	·0156250
2 gal., or 1 peck.	·0312500
2 pecks	·0625000
3 ditto	·0937500
4 do., or 1 bshl.	·1250000
2 bushels... ...	·2500000
3 ditto	·3750000
4 ditto	·5000000
5 ditto	·6250000
6 ditto	·7500000
7 ditto	·8750000
8 do., or 1 qr....	1·0000000

THE USE OF THE FOREGOING TABLES.

To convert a compound into a decimal quantity.

RULE.—Write down on the left of the decimal point the number that is of the same denomination as the integer in the table, and take from the table the decimal parts corresponding to the other denominations, and you will have the decimal required.

EXAMPLES.

1.—What decimal of the pound sterling is 9s. 11¾d.?

9s. =	£0·45
11d. =	0·045833
¾d. =	0·003125
	£0·498958

2.—Write decimally 1 yard 2 qrs. 2 nails?

yd.	1·
2 qrs.	0·5
2 nls.	0·125
yd.	1·625 Ans.

NOTE.—When the table does not, on account of the next denomination contain the number of the preceding one, for which a corresponding decimal may be required, it may be conveniently found by adding together the decimals of two quantities of the same denomination, that make the required quantity.

EXAMPLE.

3.—What decimal of a cwt. is 19 lb.?

lbs.	cwt.
14 =	0·125
5 =	0·0446429
19 =	0·1696429 Ans.

To reduce any decimal to the equivalent in parts of money, weights, measures, &c.

RULE.—Multiply the given decimal by the number of units contained in the next lower denomination of that species of quantity of which your decimal is; proceed till you come to the lowest part, and the several parts will be the quantity required.

EXAMPLES.

4.—What parts of a pound sterling are contained in 0·73825?

0·73825 × 20 = s. 14·76500 × 12 = d. 9·18000 × 4 = far. 0·72000 Ans. 14s. $9\frac{72}{100}$d.

5.—Reduce ·49723 to the parts of a cwt.?

·49723 × 4 = qr. 1·98892 × 28 = lb. 27·68976 × 16 = oz. 11·03616 × 16 = drs. 0·57856. Ans. 1 qr. 27 lb. 11 oz. 0½ d.

ASSIMILATION OF DECIMAL COINS WITH THE PRESENT CURRENCY.

EXPLANATION.

ALL who have written or spoken on the advantages of a decimal currency agree that £1 sterling shall remain as the integer, and to reduce £1 to decimals or tenths, we must divide it into 1000 parts, equal in weight and value to 960 farthings; ¼d. is not $\frac{1}{1000}$, but $\frac{1}{960}$ part of a pound sterling. It is, therefore, evident that ¼d. will not suit our present purpose; for if we allow 1000 farthings, as they now stand, for £1, we lose 40 farthings. We must, therefore, adjust these two numbers, so that 1000 of the new coins will be equal to 960 of the old, which is done thus: As 960q. : 1000m. :: 1q. :: $1\frac{1}{24}$ mil. This shows that if £1 be divided into 1000 parts, ¼d. is equal to $1\frac{1}{24}$ of these parts weight in copper, which we prove thus: As 1q. : $1\frac{1}{24}$m. :: 960q. : 1000 mils. It is clear from these proportions that we require only to deduct from each farthing its $\frac{1}{24}$ part weight in copper, and from the quantity so deducted to make 40 new pieces, which we add to the 960 so reduced, then we have 1000 pieces equal to 960, or £1 sterling.

This disposes of the highest and lowest denominations of our decimal currency—the pound sterling and its $\frac{1}{1000}$ part or mill.

Having the farthing adjusted, we next proceed to the penny. We have 12d. to the shilling, but let us substitute a penny, 10 of which will be equal in weight and value to the 12. To arrive at this let us say: As 10n.p. : 12o.p. :: 1np. : $1\frac{1}{5}$o.p. If we make a new penny $\frac{1}{5}$ times heavier than the present, we have 10 pennies equal to 12d., or one shilling. This arrangement will give us 200d. to the pound sterling, instead of 240d. as it now stands. To prove this, say: As 200n.p. : 240o.p. :: 1n.p. : $1\frac{1}{5}$o.p.; and further, as $1\frac{1}{5}$o.p. : 1n.p. :: 240o.p. : 200n.p. But let us observe here, that 200 is not a $\frac{1}{100}$, but a $\frac{1}{5}$ of a pound in mils; and were we to stop at this, our system would be imperfect. To remedy this imperfection, and still retain the penny we have adjusted, let us have a new coin value 2 of the new pennies, equal to 10 mils, 10 of which are equal to 1 florin, and 100 equal to £1.

Mils.		Cent.	Mils.		Cents.	Florins.	£
1	=	0	100... ...	=	10	= 1	= 0
10	=	1	1000... ...	=	100	= 10	= 1

This completes our system of decimal currency, beautifully simple, without disturbing any other of our coins, and without a particle of gain or loss. The Author, through the kindness of a friend, has had an opportunity of perusing the report of evidence before a Parliamentary Committee, 1853, and is happy to find a near approach to his views on the subject. His plan of reducing the farthings makes 960 exactly equivalent to 1000, whereas, the plan recommended to the committee is a reduction of 4 per cent. on the 1000, instead of 960, leaving the 960 equal only to 998$\frac{4}{5}$ mils, making a difference of 1$\frac{4}{5}$ mils in the pound sterling. This may appear insignificant; but to the business man it is important, as the defalcation is £1 12s. in every £1000.

The adjustment of the copper coins is deduced from the following analogy. We take the lb. avoirdupois for our standard :—

ASSIMILATION TABLES.

TABLE 1.

	Oz.	Drs.	d.	Q.	Mils.	£	s.	F.	c.	m.
10lb. of copper =	160 =	2560 =	240 =	960 =	1000 =	1	0	=10	0	0
1lb. of copper =	16 =	256 =	24 =	96 =	100 =	0	2	= 1	0	0
½lb. of copper =	8 =	128 =	12 =	48 =	50 =	0	1	= 0	5	0
¼lb. of copper =	4 =	64 =	6 =	24 =	25 =	0	0	= 0	2	5

TABLE 2.

10lb. of copper = 160 oz. = 2560 drs. = 960 q. = 1000 ms. = £1.

1st. Let us have 1000 pieces of 2$\frac{1}{2}\frac{4}{5}$ drachms each, and they are equivalent to 960 pieces, each weighing 2$\frac{4}{5}$ drs., as will appear by table 1.

TABLE 3.

1lb. of copper = 16 oz. = 256 drs. = 100 m. = 1f.=2s.

2nd. Reduce 24 pennies of 10$\frac{4}{5}$ drs. each, its present weight, to 20 pieces of 12$\frac{4}{5}$ drs. each, and we have 20 pieces equal in weight and value to 24, or 1 florin, or 2s.

TABLE 4.

¼lb. = 8 oz. = 128 drs. = 1s. = 5 cents.

3rd. Reduce 12 pennies of 10$\frac{4}{5}$ drs., its present weight, to 10 pieces of 12$\frac{4}{5}$ drs. each, and we have decimal 10, equal to 12, or 1s., or 5 cents.

TABLE 5.

¼lb. = 4 oz. = 64 drs. = 6d. = 2 cents 5 mils.

4th. Reduce 6 pieces of 10$\frac{4}{5}$ drs. each, to 5 pieces of 12$\frac{4}{5}$ drs. each, and we have 5, a decimal equal to 6, or equal to 2c. 5m.; and thus our system is complete.

PROOF.

	Pieces.		Drs.		Drs.		Pieces.		Drs.		Drs
1st.	960	× by	$2\frac{4}{5}$	=	2560	3rd.	12	× by	$10\frac{4}{5}$	=	128
	1000	× by	$2\frac{14}{25}$	=	2560		10	× by	$12\frac{4}{5}$	=	128
2nd.	24	× by	$10\frac{4}{5}$	=	256	4th.	6	× by	$10\frac{4}{5}$	=	64
	20	× by	$12\frac{4}{5}$	=	256		5	× by	$14\frac{4}{5}$	=	64

Thus it will be seen by the above arrangement and proof given that we have laid down pure decimal numbers, with their proportionate weights and value in copper, assimilated to our present currency, and which can at once be changed into decimals without any loss to the Mint or the public; and further, we can retain our sovereign, half-sovereign, crown, half-crown, shilling, and sixpence without any alteration, as will be seen by the following tables:—

TABLE 6.

£	Florins.	Cents.	Mils.
		1 =	10
	1 =	10 =	100
1 =	10 =	100 =	1000

TABLE 7.

£	s.	d.		Fls.	c.	m.
1	0	0	=	10	0	0
0	10	0	=	5	0	0
0	5	0	=	2	5	0
0	2	6	=	1	2	5
0	1	0	=	0	5	0
0	0	6	=	0	2	5

The only coins to be disturbed are the farthing and penny; to these must be added the new piece of the value of 2 of the increased pennies, and these are all that will be necessary to give a most simple and complete system of decimal currency.

We give the following example to show with what brevity this system is adapted for the counter and counting-house calculations:

Suppose we require to know the amount of 1793 yards of cloth at 2 florins 5 cents 5 mils per yard? All that is required is, to multiply the quantity (1793) by the mils in 2f. 5c. 5m. (255), the product presents the answer at once.

1793
255

8965
8965
3586

£457·215 or £457 2f. 1c. 5m. Ans.

Thus it will be seen that simple multiplication alone is the only rule necessary in making such calculations—vulgar or decimal fractions are never required. The scale laid down is nothing more nor less than the numeration table; hence it will easily appear that the units are mils, and tens cents, the hundreds florins, and the thousands pounds. Interest, discount, and all other calculations will be found equally simple. In books of accounts, by this system the money columns will be only two; as all calculations will be made in pounds and mils, the mils can never occupy more than three places of figures, because if you have 1 florin 2 cents 3 mils, it will read 123 mils.

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